

Edited at the
Massachusetts Institute of Technology
April, 1969. Price, \$1

Jay W. Forrester, Alan F. Westin,
George H. Ellis, Joseph Weizenbaum,
Nicholas P. Negroponte, and
Edward E. David, Jr.



Technology Review

Computers
in the Service
of Society



technology review

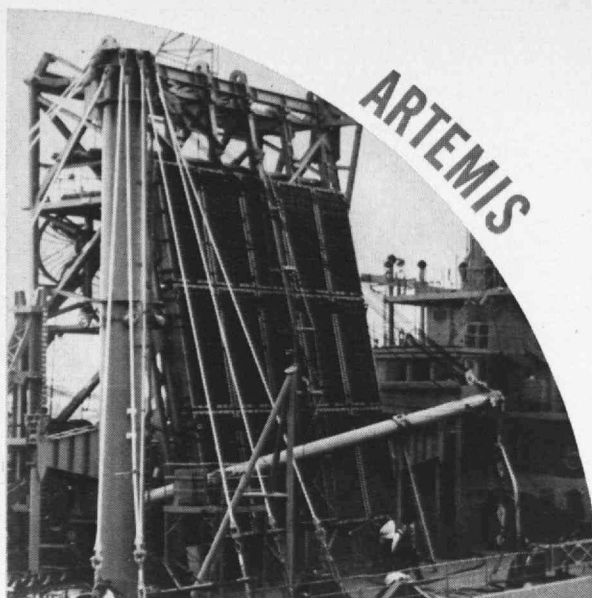
Published by MIT

This PDF is for your personal, non-commercial use only.
Distribution and use of this material are governed by copyright law.
For non-personal use, or to order multiple copies please email
permissions@technologyreview.com.

TR-208A/SQS-23



ARTEMIS



AN/BQG-4



ASROC (MK-44 TORPEDO)



MASSA TRANSDUCERS in today's advanced sonar capabilities

Massa Division is proud of its proficiency in major long-term ASW projects, such as: ARTEMIS, ASROC, DASH, PUFFS and PAIR. In the design, development and manufacture of sonar devices, whether acoustic projectors, transducers or hydrophones, Massa has met the rigid specifications of each project with long-range reliability. Experience has included designs using all types of active materials: piezoelectric (ADP) crystals; polarized ceramics; magnetostriction and electrodynamic elements.

With more than 20 years of proven capabilities, Massa Division is keeping pace with new concepts and advanced material technology providing governments and industries with a wide range of sonar devices for surveillance and ocean systems equipment.

For additional information on Massa's capabilities in the design and manufacture of underwater acoustic components and systems, write, wire or phone Massa Division in Hingham, Mass.

Phone (617) 749-4800 TWX 710-348-0162



MASSA DIVISION
DYNAMICS CORPORATION OF AMERICA

280 LINCOLN STREET • HINGHAM, MASSACHUSETTS 02043

Light purse, heavy heart

BENJAMIN FRANKLIN



Cambridge Trust Company
HOLYOKE CENTER, HARVARD SQUARE
326 MAIN STREET, KENDALL SQUARE
876-5500
MEMBER F.D.I.C.

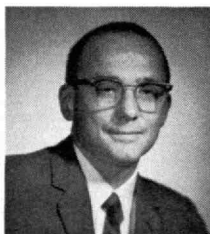
What MECHANICAL ENGINEERS do at Kodak

They design new products and better performance into existing ones, figure out the best possible ways to manufacture the products; apply pure reason through mathematical tools to make physics serve—not oppose—human needs; create the right physical tools, the plants to house them, and the services to keep them functioning; get out into the field, showing customers how to get their money's worth, and bring back word on how to do better in the

future. Some typical assignments are in development of automatic and semi-automatic manufacturing equipment; production-line layout, precision tooling, and materials handling; design and development of control units and instrumentation devices; creative design of scientific, industrial, business, professional, and amateur photographic apparatus; economic engineering, cost analysis, and methods engineering; utilities and facilities engineering.

—and chemical, industrial, and electrical engineering assignments can sound equally impersonal

Yes, it is possible to draw a lifetime's pay without much excitement or satisfaction. If you don't mind it that way you'll be easier for the boss to handle. Just await instructions and carry them out to the letter, docilely.



This docile-looking Kodak engineer did not operate that way. That's why we brag about him below. There are others who would have made equally good examples.

Tell us about yourself with a note to

EASTMAN KODAK COMPANY

Business and Technical Personnel Department
Rochester, N. Y. 14650

An equal-opportunity employer

Kodak

Van Putte is the name—Douglas—and plastics* is the game. While other Kodak engineers find strong interest in parts of the plastics market where a one-cent change in price can turn failure into success, or vice versa, Van Putte's work is having the effect of upgrading acrylic polymers into better optical materials than the great European lens makers of yore had for fabricating their precious jewels—and a good risk for upholding the public's confidence of reasonable success in picture-taking. Our engineers in the South, who work with plastics we make, spread themselves very widely into marketing activities; Van Putte, working with plastics we buy, has done himself equal credit by digging deeper into one circumscribed but important engineering topic than we think has ever been dug before. Van Putte, born (31 years ago), brought up,

*This word has taken on a broader, more diffuse meaning in certain non-technical circles of contemporary society. Actually, we do have other concerns than plastics, whether broadly or narrowly defined.

and educated in the North, likes working in Rochester just as much as the Southerners prefer their part of the country.

How it went: Always enjoyed math, of course. Master's in heat transfer and fluid flow. First Kodak assignment doing, logically enough, heat-transfer calculations. Bountiful supply of scratch pads, easy access to pencil sharpener and computer, no extra information on big picture into which calculations fit. Proves patience for eight months. Then manufacturing technology department on consumer-goods side of house decides it too could profit from a little campus-fresh sophistication in heat-transfer analysis. Van Putte overjoyed to accept challenge.

New single-minded assignment to learn all he can about injection-molding process. At least that's how the boss's boss now remembers the assignment. Van Putte remembers it a little differently. More like "Is it the temperature that's wrong in those lens-molding machines? The pressure? Or is it the flow rate?" On a certain lucky day,

after a year or so of continuing to scratch away for data on first one of these parameters and then another, Van Putte sells a program of fundamental studies with sensors for all the injection-molding parameters and on their relation to the parameters of optical performance in the photographic lenses produced. Thixotropic nature of polymer melt properly allowed for. Feels now in retrospect it took him too long to make his program pay off. Others take kinder view, drink toasts to Van Putte's health, look forward to next phase of his work wherein he educates injection-molding machines to know about the optical performance of the lenses they turn out.

Well known fact in industry that when a program turns out well, it was the big boss's idea. Van Putte crafty enough to understand that fact. Boss also crafty. Knows better than to call in a green young engineer and tell him to make a quantum jump in technology. Even if that's what he wants done.

INTRODUCTION TO COMPUTER SCIENCE

John K. Rice, and John R. Rice, *Purdue University*

The authors use problem solving as the central theme in this presentation of the basic concepts and processes of computer science. Interpreting problem solving in a broad sense, they divide the material into five main topics: problems, algorithms, languages, the representation of information, and computers. The book is designed to allow the instructor maximum flexibility in his choice of topics and the order of their presentation. *Instructor's Manual*. May 1969/288 pages/\$9.50 (tent.)

ELEMENTS OF BASIC FORTRAN IV PROGRAMMING

Wilson T. Price, *Merritt College*

This text offers two unique features: a carefully structured, relatively measured pace of presentation designed for the student of average ability, and an arrangement of topics which allows the student to successfully use a computer early in the course. *Instructor's Manual*. April 1969/416 pages/\$5.95 paper (tent.)

ELEMENTS OF IBM 1130 PROGRAMMING

Wilson T. Price

This book provides a thorough understanding of the fundamental concepts of stored program computers through a study of the IBM 1130. The 1130 Symbolic Assembly Language is used in all instances, and emphasis is placed on machine language equivalents of significant forms. 1968/496 pages/\$9.95

INFORMATION PROCESSING MACHINES

Panos A. Ligomenides, *University of California, Los Angeles*

The author unifies and correlates essential topics in the operation, organization, and design of information processing machines in this introductory level book. Topics covered include machine organization, arithmetic, logic and sequential circuit design, coding and programming. *Instructor's Manual*. May 1969/352 pages/\$9.50 (tent.)

A GUIDE TO PL/I

Seymour V. Pollack and Theodor D. Sterling, *both of Washington University, St. Louis*

The organization of this detailed description of the PL/I programming language provides the student with enough basic tools to write complete programs early in the course. January 1969/576 pages/\$9.95

FORTRAN PROGRAMMING FOR THE BEHAVIORAL SCIENCES

Donald J. Veldman, *The University of Texas*

An introduction to the essentials of FORTRAN IV, this book explains those features of the FORTRAN language most essential for behavioral science programming—statistical description and analysis of quantitative data. Three general areas are covered: varieties of hardware (machines) and software (programs), essentials of the FORTRAN language, and a comprehensive library of statistical routines. 1967/416 pages/\$6.50 paper

COMPUTER PROGRAMMING TECHNIQUES

Volume 1: Machine/Assembly Language
Volume 2: FORTRAN Language

R. J. Wimmert, *University of South Florida*

This series of computer programming texts is presented in the form of semi-completed class notes. Volume 1 introduces computer systems and the programming of a simple computer, the IDIAC. Volume 2 develops the principles of the compiled language, FORTRAN IV, in easily understood steps. *Instructor's Manual*. Volume 1: October 1968/160 pages/\$4.95 paper. Volume 2: March 1969/256 pages/\$4.95 paper

BASIC PROGRAMMING CONCEPTS AND THE IBM 1620 COMPUTER

Second Edition

Daniel N. Leeson and Donald L. Dimitry, *both of IBM and Eric K. Wallstedt, Norwalk State Technical College*

This revision reflects the growth and sophistication of the 1620 since 1962 with particular reference to the addition of disk auxiliary storage and the IBM Monitor systems. *Instructor's Manual/Solutions Manual*. November 1968/480 pages/\$9.95

ELEMENTS OF DATA PROCESSING MATHEMATICS

Wilson T. Price and Merlin Miller, *both of Merritt College*

Written for students who intend to enter the field of data processing and computer programming, this book relates the study of logic to contemporary computer languages and allows considerable versatility in course organization. *Solutions Manual*. 1967/464 pages/\$10.95

INTRODUCTION TO COMPUTING THROUGH THE BASIC LANGUAGE

Richard L. Nolan, *University of Illinois, Urbana*

Written to acquaint students with the potential capabilities of computers in solving diverse problems, this text uses the BASIC language to introduce students to computing fundamentals. May 1969/272 pages/\$9.00 cloth (tent.)/\$6.00 paper (tent.)

INTRODUCTION TO ANALOG COMPUTER PROGRAMMING

Dale I. Rummer, *University of Kansas*

Designed for second semester freshmen and sophomores who have not yet studied differential equations, this book's purpose is to motivate students of mathematics, physics, and engineering by showing applications of physical laws and mathematical tools in solving problems. May 1969/320 pages/\$8.95 (tent.)

Computer Books from HRW



Please ask your HRW representative for an examination copy or write to College Promotion

Holt, Rinehart and Winston, Inc.

383 Madison Avenue, New York, New York 10017



Technology Review, Reg. U.S. Patent Office, is published nine times each year (in October/November, monthly from December through June, and in July/August) at the Massachusetts Institute of Technology.

Copyright 1969 by the Alumni Association of the Massachusetts Institute of Technology.

Inquiries regarding editorial contents, subscriptions, and advertising should be addressed to:

Technology Review
Room E19-430
Massachusetts Institute of Technology,
Cambridge, Massachusetts, 02139.

Area Code 617, telephone 864-6900, extension 4871.

Technology Review is printed by the Lew A. Cummings Company, Manchester, New Hampshire. Second class postage paid at Manchester, New Hampshire.

Price: \$1 per copy, \$7 per year in the United States, \$8 in Canada and foreign countries. Please allow three weeks for changes of address, and give both old and new addresses in all requests.

Technology Review is represented for advertising by:

Good, Laidley and White, 50 East 42nd Street, New York, N.Y., 10017, telephone (212) 986-6210.

Mediarep Center/New England, 710 Statler Office Building, Boston, Mass., 02116; telephone (617) 426-6762.

Donald P. Severance, Publisher
John I. Mattill, Editor
Fred Wheeler, Acting Managing Editor
Richard F. Wright, Advertising Manager
Ruth King, Associate Editor Emerita
Deborah Shapley, Associate Editor
Lynn Thomas, Associate Editor
Brenda Kelley, Alumni News Editor
Jill Ackerstein, Production Manager
Margaret S. Goodhue, Advertising Assistant
John S. Pfeil, Jr., Business Manager
Karen Oddo, Circulation Assistant

Editorial Advisory Board

George A. W. Boehm, Science Writer
Carroll G. Bowen, Director of The M.I.T. Press
Gordon S. Brown, Dugald C. Jackson
Professor of Engineering, M.I.T.
Victor Cohn, Science Editor of the *Washington Post*
Robert C. Cowen, Science Editor of *The Christian Science Monitor*
Victor K. McElheny, Science Editor of the *Boston Globe*
Leonard F. Newton, Vice President of Opinion Research Corporation
Walter A. Rosenblith, Chairman of the Faculty and Professor of Communications Biophysics, M.I.T.
Irwin W. Sizer, Dean of the Graduate School, M.I.T.
Eugene B. Skolnikoff, Associate Professor of Political Science, M.I.T.
Gregory Smith, President of Eastman Gelatine Corporation, *Chairman*
Carroll L. Wilson, Professor of Management, M.I.T.

The cover

The cover and title pages in this issue of *Technology Review*, abstractions suggesting the increasing thrust and complexity of computer science, are by Dietmar R. Winkler of the M.I.T. Office of Publications

Next month

For May, *Technology Review* announces:

Warren K. (Doc) Lewis, the "founder of the chemical engineering profession," on the role of engineering in modern society

Arthur R. Kantrowitz on "The Test"—a proposal for weighing new scientific proposals with judge and jury

Benjamin L. Averbach on how a metallurgist and an electrical engineer tested a new set of golf clubs

The dramatic moments of Apollo 9 described in the words of the crew while making the historic first flight of a spaceship which could not land on the earth where it was built

Departments

Science Review 8
Robert C. Cowen

Man and his technology as an agency of a universal life force

Government Review 10
Clyde C. Hall

How the Nixon-DuBridge axis is impacting on Congress' view of science policy

European Report 12
Daniel S. Greenberg

The failure of European scientific cooperation poses questions for the U.S.

Book Review 15
Joseph Mindel

The avant-garde is an intellectual, not a scientific, elite

Strobe Probe 96
Harold E. Edgerton

A photographic abstraction to perplex perceptive readers

Technological Crossword 97
John M. Sandor

Puzzle Corner 98
Allan J. Gottlieb

Geometry, chess, series, and number theory problems for all tastes

Correspondence Review 101

Readers write on social and technological issues in the *Review*

Technology Review

Articles

Six papers developed from presentations at the 1968 M.I.T. Alumni Seminar come together as a special issue of *Technology Review* on Computers in the Service of Society. The *Review* acknowledges with great appreciation a grant of the Kerr Foundation, Inc., of Oklahoma City which has helped make possible this extended editorial material.

A Deeper Knowledge of Social Systems 21

Jay W. Forrester

How the computer is about to assume a new—and vastly important—role in the analysis of society's most urgent problems

Computers and the Protection of Privacy 32

Alan F. Westin

The computer at once threatens personal privacy and offers the opportunity immensely to enhance it

Computer-Based Services in Personal Transactions 40

George H. Ellis

The processing of financial data represents the computer's greatest impact on the common man

Towards a Humanism Through Machines 44

Nicholas P. Negroponte

Must computers be in fact the antithesis of the humane in every problem to which they are applied?

The Two Cultures of the Computer Age 54

Joseph Weizenbaum

Must the computer represent yet another force toward an intellectual and technological elite in a society proclaiming its democracy?

Computing and the Professions 58

Edward E. David, Jr.

The ultimate challenge is to make truly effective the computer's potential for organizing the vastly complex

Trend of Affairs

The atmospheres of Jupiter and Saturn fit a model with which the other planets are inconsistent 70

Inhomogeneities in the lunar mass lead to an unusual—and unverified—theory 71

A plea to explore the important alternatives to escalation—before we escalate 71

Replacing high frequencies with low yields a new hearing aid 72

U. S. health services move toward greater protection for coal miners 73

An uncompromising view of the consequences of sonic boom 74

Can effective prediction of solar proton showers benefit the U.S. space program? 75

Technology increases the needs while it improves the tools of weather science 75

Who is to say that our ability to control evolution is not part of evolution itself? 76

The intransigence of the mind—not the frustrations of technology—is the enemy of progress 77

A preview of the ultimate conference call 78

Is our climate changing . . . and what has man to do with it? 78

The same questions about the oceans, but the time scale is different 79

When it comes to being creative and imaginative, who is disadvantaged and who is not? 80

The lunar grand tour awaits. But first must come reusable nuclear spacecraft and usable lunar resources 81

Al Capp and the supernatural in Ghana 82

Cambridge Journal

Puerto Rico as a laboratory for applied social technology 87

A new Boston company proposes commercial television—with an educational turn 88

A three-dimensional champion for the real users of architecture 89

Apollo 8 in Cambridge: "Tighten your seat belts and listen to the countdown" 90

The new environment of commitment to urban research . . . 91

. . . and a university's new commitment to urban problems 92

Guide to Cambridge Architecture:

Ten Walking Tours

by Robert Bell Rettig

Covering essentially the whole city of Cambridge, Massachusetts, in a series of ten neighborhood tours, this book describes hundreds of buildings of all sorts, institutional, commercial, residential. Each building is illustrated with a small photograph; the date of construction and the name of the architect, when known, are given, together with a succinct comment by the author on each building, clarifying architectural and historical points and offering evaluations. The format of the book is such that it works to its best advantage when used as an actual portable guide, but it serves as well as a guidebook with which readers not in Cambridge can take informative imaginary walks.

\$8.95 paperback, **\$2.95**

The Rehabilitation Planning Game:

A Study in the Diversity of Neighborhood
by Langley Carleton Keyes, Jr.

It was to create an atmosphere of trust that the "rehabilitation planning game" came into play, whereby residents, instead of impotently fighting City Hall, are brought into negotiations with it, and both "teams" bargain their way through a proposed plan point by point, the object of the game being for each side to "win," on its own terms. This is the subject of this perceptive and sensitive study, which follows the progress of negotiation through three Boston projects — the South End, Charlestown, and Washington Park — from inception to plan approval.

In a final chapter, the author applies the lessons learned from his study of the urban rehabilitation planning process to the recently enacted Model Cities Program.

\$10.00

Urban Dwelling Environments:

An Elementary Survey of Settlements for
the Study of Design Determinants

by Horacio Caminos, John Turner, and
John Steffian

A comparative method for studying the urban environment is attempted in this book, whereby the total environment is successively scaled down to smaller and smaller segments, so that at each stage the segment under study is already placed in its larger physical and social context. Sixteen localities (eight each in North and South America) are examined in a consistent fashion, allowing for multiple cross comparison. The North American localities are in and around Boston.

\$20.00 a loose sheets, **\$15.00** a

The MIT Press

Cambridge, Massachusetts 02142

**STUDIES IN
NEIGHBORHOOD**
Cambridge, Boston, South America

This is the most powerful, yet easiest to use, calculating/computing system available. It's also the most versatile. You can create your own individualized system by selecting true building block modules from a family of peripheral devices larger than all competitive calculating products combined. Start with a basic 300 Series calculator if you like; add accessories as needs grow without worrying about compatibility, obsolescence, retraining or special program languages. The 370 will loop, branch, perform subroutines and manipulate arrays. You can have up to 480 steps of program storage and up to 64 separate data storage registers, also automatic typewriter or teletypewriter output, CRT graphic display and time-sharing basic keyboards for your associates.

The 370 solves these problems...

for Engineers and Scientists:

**Inversion of 6 x 6 Matrices,
Roots of Equations,
Up to 7 Simultaneous Equations,
Fourier Analysis.**

for Statisticians:

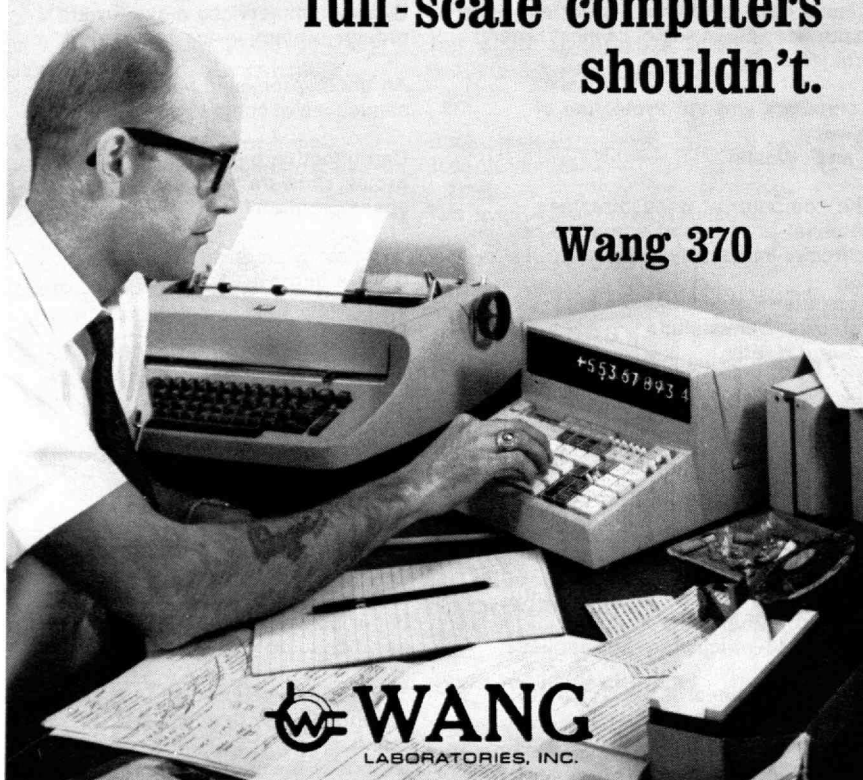
**Mean, Variance and Standard
Deviation,
2nd-order Regression Analysis,
Distributions such as:
Binomial, Normal Probability, etc.**

And also:

**General Nth-order Regression,
Multiple Regression,
Analysis of Variance,
Factorial Design.**

These and many other highly-useful programs are furnished free in a 250 page program library. Three volumes of basic calculator programs and a two-volume 370 reference manual are also offered. Call now for complete details.

**Solves problems
ordinary calculators can't,
full-scale computers
shouldn't.**



Wang 370

Dept. 00, 836 North St., Tewksbury, Massachusetts 01876 • Tel. 617 851-7311

Call today for immediate trial:

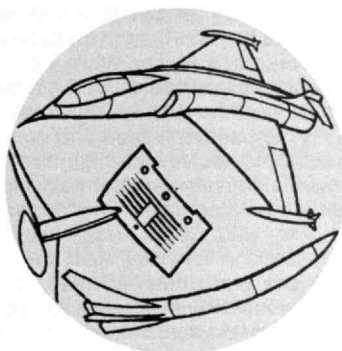
(201) 241-0250	(215) 642-4321	(309) 674-8931	(412) 366-1906	(601) 982-1721	(714) 234-5651
(203) 223-7588	(216) 333-6611	(312) 889-2254	(415) 692-0584	(602) 265-8747	(716) 381-5440
(203) 288-8481	(301) 588-3711	(313) 278-4744	(504) 729-6858	(608) 244-9261	(717) 397-3212
(205) 595-0694	(301) 821-8212	(314) 727-0256	(505) 255-9042	(612) 881-5324	(805) 962-6112
(206) 622-2466	(303) 364-7361	(317) 631-0909	(512) 454-4324	(615) 588-5731	(816) 421-0890
(212) 682-5921	(304) 344-9431	(402) 341-6042	(513) 531-2729	(616) 454-4212	(817) 834-1433
(213) 278-3232	(305) 564-3785	(404) 633-4438	(517) 835-7300	(617) 851-7311	(901) 272-7488
(214) 361-4351	(305) 841-3691	(405) 842-7882	(518) 463-8877	(702) 322-4692	(916) 489-7326
			(601) 234-7631	(703) 877-5535	(919) 288-1695
				(713) 668-0275	

We offer all the horizons you can discover.

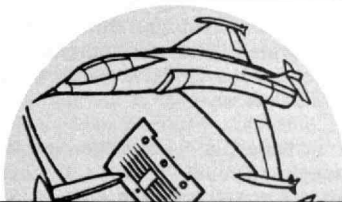
Systems Engineers: Join the future-makers at Raytheon's Bedford Laboratories.

Work with talented associates to anticipate and shape the 1970s and beyond. You'll broaden your experience and skills by designing and developing some of the most sophisticated of systems, such as advanced radar systems, avionics systems, tactical defense systems, guided missile systems, and others.

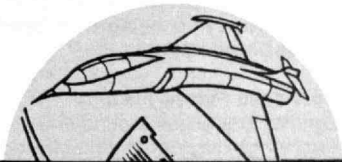
With new responsibility and scope, you'll receive excellent pay and broad fringe benefits. You'll be secure in the knowledge that you've placed your



career with a division that has a background of extended growth through technical excellence.



For the type of challenge that's met as you unfold new horizons, come to Raytheon's Bedford Laboratories in Bedford, Massachusetts. For an interview, send your resume and present salary information to Richard J. Neal, Dept. 100, Missile Systems Division, Raytheon Company, Hartwell Road, Bedford, Massachusetts 01730.



An equal opportunity employer

Specific Impulse and the Species Sapiens

Kraft Ehricke says he's a "bad prophet." A decade ago, he forecast a manned lunar landing as marginally possible for the early 1970's. Now men are getting ready to set foot on the lunar wasteland this summer.

When it comes to foretelling the future, this veteran space technologist is too conservative. So maybe we should pay attention when he now envisions humanity as the agent whereby life may establish itself throughout our solar system—far out as that may seem. Indeed, his vision seems no more fantastic than that of biologists who talk seriously of humanity as the means by which the evolution of life may be redirected here on earth.

This concept of mankind as an agency of the life force puts the march of science and technology in rather humbling perspective. It suggests how carefully we should consider the long-term implications of trends we now may be setting in motion.

Of course, you could object that scientists and engineers who think of mankind this way just express a colossal conceit. But the impression I get in talking with them is one of humility, maybe even of perplexity. For this fantastic thing they envision is implicit in the work they are doing today.

Mr. Ehricke's vision grows directly out of the long-range forecasts of practical spaceflight possibilities he makes for North American Rockwell Corporation. North American, while basking in the success of its Apollo spacecraft, keeps one eye on future business. To help in this, Mr. Ehricke looks ahead to the ultimate spaceship concepts that could be feasible over the next few decades.

In a recent conversation, he pointed out that we've got to move to nuclear propulsion to get anywhere with solar system exploration and exploitation. Chemical rockets, such as the Saturn, can put spaceships on course for Mars. Electric rockets, which deliver a small but steady thrust by accelerating ions out of a rocket nozzle, can help make a Mars exploration trip efficient. But neither of these systems really has the oomph to

make the other planets part of man's hegemony.

The figure of merit that illustrates this is specific impulse. That's the amount of rocket thrust you get per pound of propellant used per unit time. It measures the efficiency of a rocket. While ion rockets are very efficient in this respect, they have such weak thrust it takes a long time to build up speed. But couple high specific impulse with high thrust and you have a combination that puts most, if not all, of the solar system within man's range.

Mr. Ehricke points out that we're on a plateau with chemical rockets, for they can't go beyond specific impulses of a few hundred seconds. The kind of nuclear rocket now being developed will push that to around 800. But that's just another plateau of thrust and efficiency, too weak for the kinds of space travel Mr. Ehricke foresees.

What's needed, he says, is to move into the range of specific impulses of several thousands of seconds and beyond. That calls for running reactors so hot that the solid-core types now being developed for space flight would melt.

Gas Cores and Pulsed Fusion

Mr. Ehricke would get around the problem by getting rid of the solid core altogether. He would use the uranium as a fissioning gas, as hot and bright as the sun. He would contain it within a whirling vortex of cool gas, helium, say, or neon. This gas would flow through the reactor. Being light, it wouldn't mix with the uranium. It would only confine and insulate it from the walls. The walls, in turn, would be of a material transparent to heat radiation and neutrons. These would pass through to heat a surrounding flow of propellant gas.

The trick would be to get walls that absorb so little energy they would not vaporize. Mr. Ehricke says the gas-core reactor seems quite feasible. It's one of the main lines of power plant development now discussed. But getting the right wall material—carborundum or perhaps a ruby—would require a major development effort. For the material would have to be very stable as regards

its energy absorption. If it became only a little cloudy, it would soak up energy and vaporize.

The reactor itself would be easy to control and to shut down. All the space ship captain would do, in principle, would be to pull the uranium gas out of the core and disperse it in the helium in a holding tank. To start up again, he'd inject the gas, crank up the confining vortex, and soon be up to power.

While he admits that the concept is "far from being operational," Mr. Ehricke thinks that \$250 to \$300 million a year spent on a forceful development project over the next decade could put the gas-core nuclear rocket in business by the mid-1980's. "The problems," he says, "are recognized. The possible solutions are recognized. The walls are the worst problem, especially because stop-start cycles could change their properties. If they cloud, however slightly, they're gone."

Because of the wall problem, he doubts that the gas-core nuclear rocket could reach its theoretical specific impulse of 5,000 seconds. But he considers 1,700 to 2,000 seconds quite feasible. And that's four to eight times the efficiency you can get with chemical rockets.

This could put Mars within man's easy grasp. To Mr. Ehricke, it also represents a propulsion plateau well below the ultimately practical. To move ahead, he would go to the hundred-million-degree temperatures of nuclear fusion. This might be in the form of a genuine hydrogen fusion reactor. But right now, people working on the development still see an indefinitely long road ahead of them. Mr. Ehricke would sidestep this by using hydrogen fusion explosions as his basic propulsive force.

He would use repeated explosions, pushing against a pressure plate at the ship's rear. Shock absorbers would translate this into a much smoother thrust for men riding up front. If used well away from earth or other planets, this should not seriously contaminate the vastness of solar-system space, Mr. Ehricke says. With the power of this system, he foresees massive space ships of two million pounds or more.

Colonizing the Planets

Wild though this sort of thing sounds to laymen like me, Mr. Ehricke thinks such pulse rockets could be developed by the 1980's if we started serious work on them now. We won't do this, he admits, partly because the test ban treaty now forbids nuclear explosions in space. But given the desire to move in this direction, and the required international agreements worked out over the next 10 to 20 years, he thinks pulse rockets may well be flying by the end of the century. He says that such rockets could finally bring much of the solar system within our range in practical ways. He envisions interplanetary commerce whose value would justify building truly vast space freighters.

"If I were transporting 50 million pounds of ore from Mercury, say, I could justify a five-million-pound ship. Ten per cent—that's a good ship-to-payload ratio. And that ship would be rugged enough so that I could safely explode pulses of half a megaton behind it. I might be able to bring ore from Mercury at \$2 a pound or less."

He also thinks of using such rocket power to colonize planets. He would transport the technology needed to make them habitable. Perhaps, he suggests, you could even do such things as diverting a comet to land on Mars. This could give it more oxygen and water, since comets are thought to abound in these materials.

"These things sound fantastic," he admits. "But I think we will be doing such things over the next century. We probably are the agency by which the solar system will be transformed, just as photosynthesis and life have transformed the once lifeless earth.

"Because a planet couldn't evolve life doesn't mean it might not shelter it. A family may not produce children. But it can adopt them and be very good parents. It may be that we are the agency by which life breaks out of the confines of a single planet and establishes some kind of solar-system life."

The Agent of Cosmic Change

And it may be that we will be the agency

for transforming life on its home planet, too. Drs. Robert L. Sinsheimer and James Bonner of the California Institute of Technology made this point as part of a briefing for local business executives shortly after my conversation with Kraft Ehricke.

They ran through the much-discussed developments by which biologists have come to understand the genetic code and the basic machinery of cellular life. "The living organisms of today," Dr. Sinsheimer noted, "have had the benefit of two billion years of selective evolution. Soon we shall have that cumulative ingenuity at our fingertips . . . and with it not only the power to alter the natural world but also the power to alter our very selves."

To this Dr. Bonner added that " . . . it really appears to be within our power—if not today, then in the very near future—to cause our species to develop along any line which we deem desirable." "Man," he observed, "is the current head of the animal line on an insignificant planet. But he can be the agent of change to a new line of evolution. This is a cosmic challenge. Perhaps this can meet our inner need for purpose . . . and consequence."

Such grandiose comments have become part of the public posture of biologists over the past few years. We've all heard it many times. Yet, coming as they did on top of Kraft Ehricke's visionary discussion, they stood out in startling clarity. Is it really so mystical to think of man as an agent for life?

On earth he represents the highest expression of the life force. Is it merely a manner of speaking to say he represents that force, as his self-centered intellectual and commercial pursuits take him to the planets or direct the course of evolution on earth? And is it merely conceit to feel that man has a deep responsibility both to himself and to life in this regard? Or may not Dr. Sinsheimer be right when, speaking of man's forecast new powers, he says, " . . . we must soon, in commensurate degree, alter and enlarge our conception of the place of man and his potential [in the universe]"?

Robert C. Cowen, who studied meteorology at M.I.T., is Science Editor of the Christian Science Monitor; he is a past President of the National Association of Science Writers.

The Dulcet Voice of Culture

The probability persists that substantial change will soon take place in the way the federal government supports science and technology. Time and inclination for devising new and better support methods and realigning support agencies are propitious. The power shift in political administration brought a power shift in science administration. The anticipated change in support procedures will swing around the Nixon-DuBridge axis. When Nixon took office, his reflected predisposition toward science and science support was blurred. The image cast by DuBridge, foreshadowed by his record, was, by contrast, sharp and clear. Echoes of his swearing in had hardly died away before DuBridge lighted a bright candle in the gloomy science establishment, darkened by recent and deep cuts in funds. He directed immediate release of \$10,000,000 to the National Science Foundation for research support.

Major change in Washington is influenced less by what happens downtown than by what happens uptown. What the President can do to effectuate a recommendation by his science advisor to replenish a financial shortchange in science support is limited by (a) delegated authority from Congress and (b) funds appropriated by Congress. If neither authority nor money is adequate to sustain a desired change, downtown executives must negotiate with uptown legislators for both muscle and mustard. Negotiation is difficult enough even when the negotiators meet in a friendly political atmosphere; normally the confrontation is more abrasive when, as is the case today, the negotiators come at each other from opposing political camps. Differences are likely to be put down speedily today, however, because the times are urgent enough, and the men stand tall enough to submerge them. Major reorganization of federal science support can, and probably soon will, take place because the quality quotient among change makers, downtown and uptown, is running high.

What Kind of Change?

Perhaps the most dynamic thrust-for-change arises from the heat building up from a long-smoldering dispute over philosophical premises: science-qua-science or science-qua-education. Should science, particularly basic research in

science, be supported for its own sake or as one room in the house of intellect? For a quarter century, money has been plentiful to support scientists working in comfortable "project" and "category" cloisters. The pursuit of basic research for its own sake was, and still is, a viable and vital way to keep the reservoir of knowledge high enough to prevent severe depletion from drain-off to meet the insatiable demands of technology. Nobody advocates termination of the project method of support.

Decibels in the voice of education, however, have risen to stentorian levels in the past decade, making themselves heard uptown and downtown. And the voice has been listened to—it enjoys an enormous constituency! To its very considerable credit, the scientific establishment—largely represented in this instance by the National Institutes of Health, the National Science Board, and the Office of the Science Advisor in the White House—was first to respond by devising support methods designed to meet broad educational needs as well as narrower scientific objectives. Project-type support sustained, let's say, the physics research of outstanding Professor A at Big University, but what of the promising research of his little-known colleague in chemistry, or the discerning work of a highly respected young biologist at Boondox College? To help correct such imbalances, the National Science Foundation and the National Institutes of Health developed "institutional" grants to supplement project-type support. For the education community one of the benign spinoffs of this action—largely unanticipated, one suspects, by the guileless scientific community—was that it marked the genesis of a reorientation of research-support philosophy from a base in science *per se* to a base in education.

Educators lost no time in opening wide a door left ajar. Too long, many of them felt, had big schools and big-name scientists managed the nation's business in education and research in the sciences. Some 80 percent of available federal support wound up on some 20 percent of U.S. college-university campuses.

A Model for Action

At the alert and resourceful Washington

office of the National Association of State Universities and Land Grant Colleges, the first template of what is today H.R. 35 was cut out on the desks of the Association's executive secretary, Russell Thackrey, and his able deputy, Christian Arnold. H.R. 35 is a bill to provide a national institutional grants program to support education and research in science in U.S. colleges and universities.

Hearings convened on the bill in 1968 and 1969 by Rep. Emilio Q. Daddario, chairman of the Subcommittee on Science, Research, and Development of the House Committee on Science and Astronautics, elicited favorable response from nearly all of the score-and-more top scientists and educators who testified. The price tag on H.R. 35 is "\$400,000,000 for fiscal year 1970 and, thereafter, for each fiscal year, a sum equal to 20 percent of federal funds allocated in the preceding fiscal year to institutions of higher education for support of academic science throughout the United States." The bill provides a three-way apportionment of funds: (1) one-third to institutions of higher learning as a graduated percentage of total project awards they received during a preceding year from the N.S.F. and other science-award granting agencies; (2) a third divided among states in proportion to the ratio that the total number of fulltime-equivalent undergraduate students in each state's institutions of higher education in the preceding year bears to the total number of such students in the U.S.; and (3) a third to higher-education institutions in proportion to the ratio that the total number of advanced degrees (including both second and third level degrees) awarded by the institution during the immediately preceding three years in the sciences bears to the total number of such degrees from all such U.S. institutions.

The cast of leading characters among directors of federal science policy—reflected, for example, in membership of the National Science Board—is evolving significantly to include more representatives chosen from grass-roots institutions of higher education than from science sources. The 24-member Board is the policy-directing body of the National Science Foundation. Terms of eight of its members expire every two

years. Today half of the Board members represent public institutions and their orientation is more administrative than scientific. A similar shift seems to be taking place in membership turnover on the President's Science Advisory Committee. It will be interesting to see whether the trend continues under Nixon.

Science as Culture

One other very alluring voice is being lifted to hurry forward a reorganization of agencies of the federal government concerned with research and education in the sciences. It is the dulcet voice of culture. The pure scientist, particularly the mathematician, knows its seductive appeal when he speaks of a "beautiful" equation, an "elegant" solution. But its appeal to less intellectually endowed citizens, weary of the engines of war and exhausted from trying to cope in an uptight 9-5, computerized world, is its promise of surcease from the turbulence of today's technology. Small wonder, with so much going for it, that the siren voice of the humanists was heard on Capitol Hill where the response is now manifest in the National Foundation for the Arts and Humanities, an independent agency modeled after its cultural counterpart, the N.S.F. This biased pen suggests, however, that until more projects supported by the arts-humanities foundation derail more cinema, stage, literature, art, and music from their one-track subject-matter source—the directory of deviant sex—society will probably affirm the reign of pure science over realms of beauty and elegance. Anticipated change in the management of federal support of science and education which contemplates the conjunction of science with other constituents of the cultural menage—art, literature, and music—may result in a transfused refinement of the national taste in aesthetic endeavor.

None seeks more diligently to affect such change than one of the trustees of Wesleyan University, Rep. "Mims" Daddario, respected and industrious legislator, unwavering friend of science and scientists, who asks, however, not what science can do for the community of scientists but rather what science can do for the community of man. His articulation of change concepts may yet be the most persuasive of the voices raised by planners and negotiators. Because his influence could be determinative, what he says must be listened to by institutions holding a large stake in research and education in science and technology, not least, of course, being U.S. colleges and universities. When he makes a major speech, as he did in February, a week after discussions with Drs. Killian, Kistiakowsky, Wiesner, Hernig, and DuBridge—all White House science advisors, past and present—Daddario provokes edge-of-your-seat attention. He delivered the prestigious Ferguson Lecture for 1969 at Washington University in St. Louis. His subject: "Science and the Federal Government, PPBS-1969"—PPBS referring, for this occasion, not to Planning-Programming-Budgeting System, but rather to "Policies-Plans-Bucks

for Science in the near future" (emphasis supplied). Here we are primarily concerned what he said about the projected redirection of science-support administration.

Five Proposed Schemes

Daddario described five "rather specific plans for federal science organization that seem to have gained currency."

... A prototype Department of Science, Education, and Cultural Affairs. This would be a cabinet-level organization designed to consolidate eight existing federal units:

- The National Science Foundation.
- The National Aeronautics and Space Administration.
- The Atomic Energy Commission—minus weapons development which would go to Defense.
- The National Institutes of Health.
- The Environmental Science Services Administration.
- The National Bureau of Standards.
- The Bureau of Higher Education from the Department of Health, Education, and Welfare.
- The National Foundation for the Arts and Humanities.

... A cabinet-level Department of Science and Higher Education. "It would draw together essentially the same groups, but its functions would be defined in a less sweeping fashion and would omit any responsibility for cultural development *per se*." An alternative might be "a Department of Education and Research whose functions would consist mainly of those now performed by the N.S.F., the Office of Education, and the Foundation for the Arts and Humanities."

... "A loose confederation of agencies listed under the first plan sometimes referred to as the 'G.S.A. for Science' plan." (G.S.A. is the acronym for General Services Administration, the agency that provides logistical services to other agencies of government.) "As I understand this plan, it conceives of a centralized administration of agencies involved, with common operations as to general administration, budget, and accounting procedures and the like, but with no overview or authority as to mission, priorities, program development, or operational activities."

... Establishment by Congress of a statutory Council of Advisers on Science and Education "to provide a continuing service to the President in respect to policy matters in science and technology, education, and their multiple interrelations. A further role of the Council would presumably be to meet the needs of Congress for understanding the facts and position of the administration relative to national goals in these matters."

... A revamping of the Office of Science and Technology which would broaden and strengthen it so that it might "play a more influential and hard-nosed role than it has to this point."

Which way is the wind blowing? Disdaining dictums, Daddario nevertheless lifted a tentative moist finger to the breeze: "I have reached certain conclusions with regard to some of the ramifications of the science-organization issue which I should like to share with you.

... "I do not believe an overall science czar or a single super-bureau created to govern all federal science endeavors is the answer to our problem. ... "It is too early to act on the proposition of a cabinet-level department, even one composed only of those agencies whose principal reason for being is academic science or education. We do not yet have sufficient information on the probable effects and potential of a science department to consider formal action. ... "The mere creation of more advisory groups which have no responsibility for overseeing and assessing what may result from their advice, nor any answerability to the public through its elected officials, fails to elicit much enthusiasm from me."

The Ecological Way

Having apparently eliminated all proposals from the bottom up, Daddario aligns himself on the side of those who would reaffirm the natural—and, in fact, historical—catholicity of culture which serves society best when the traditional members of its family—science, art, literature, music—live and work together:

"In order not to be destructive of society and some of its most useful institutions and mores, we should not, I think, limit our organizational considerations to science alone. As ecologists are beginning to convince us, we live in an interrelated world where each facet has its impact on every other. This I believe to be true of science and technology as well. They must not be nurtured or used independently of or without regard for the lessons taught by the social sciences, the arts, and the humanities—as well as the general processes of education."

Finally Daddario gave some indication of timing, and it leaves not too many weeks for the constituencies of science and education to make their own for-or-against positions known to the negotiators. Stating that he believed that any change made should come as a result of legislation by Congress rather than through executive order by the President, Daddario said: "The stakes are such that we should begin to make definite plans and take positive action just as soon as sufficient information is at hand and competent analysis made. I do not know when this point will be reached, but it should not exceed two years." (Emphasis supplied).

Clyde C. Hall is a Washington-based freelance writer who was formerly Public Information Officer of the National Science Foundation; he was Acting Managing Editor of Technology Review for three months in the fall of 1968.

European Science and America's Better Instincts

Multinational co-operation in big science and technology is a key part of the standard prescription for assuring European independence of American economic power. Alone, goes the argument, there is scarcely any expensive field in which a European nation can effectively compete against the United States; together, however, Europe has the talent and resources to compete in any field, and even in all fields.

No one disputes the prescription, and ample vocal support is regularly provided for it at innumerable conferences designed to foster European co-operation. But prescriptions and rhetoric are one thing; reality is another. And the reality today is that, with few exceptions, Europe is *not* succeeding in building institutions and programs to perform big science and technology. In fact, in some cases, there are serious doubts about the survivability of existing efforts for which high hopes were once held.

Basic to all the difficulties, of course, is Europe's inability so far to achieve a degree of political amalgamation that can routinely provide a stable base for funneling the resources of many nations into huge, complex, and costly ventures. Fearful of American dominance and also desirous of maintaining their traditionally strong scientific effort, the Europeans tend toward such ventures; but lacking political solidity among themselves, and fearful of losing the competitive edge with each other, especially in fields of great economic potential, they often co-operate half heartedly and frequently, for insurance purposes, duplicate European-wide efforts with their own national programs.

Faltering Efforts at Basic Research

In space, for example, where Europe is yet to achieve any considerable success, Britain recently rocked the European Space Vehicle Launcher Development Organization (E.L.D.O.) by asking to be released from its commitment to support development of a major launch vehicle. In any case, Britain announced, it would not stay in E.L.D.O. beyond the committed period, which ends in 1971. After that, it would provide, on a commercial basis, the Blue Streak rockets which serve as the first

stage of the E.L.D.O. launch vehicle, Europa.

Britain's reason for wanting out? E.L.D.O. is too expensive and too remote from commercial applications which can bring a good economic return—which is increasingly a dominant criterion in the British government's assessment of research and development projects. Rather than support E.L.D.O., Britain argued, it would be better for Europe to buy launchers from the United States and divert the savings to space applications programs, such as communications. Britain's partners balked at this proposal and held her to her commitment. But the future of E.L.D.O. is not considered bright, though one dividend of the meeting was agreement to work toward creation of a central space agency that would encompass Europe's various co-operative space efforts.

One of these, the European Space Research Organization (E.S.R.O.), is the basic research side of Europe's space programs. It is widely regarded as a successful undertaking; but, interestingly, Britain's space researchers often complain that Britain is not getting its money's worth out of its E.S.R.O. contributions.

Integral to the European space effort are formulas to assure that the member nations will receive contracts in some proportion to their contributions. The quest for fair geographic distribution of research funds is not unknown in American research politics. But the difference is that dissatisfied American states cannot drop out, whereas dissatisfied European nations can. And Italy, for one, has expressed itself as gravely dissatisfied and is loosening its ties to the program. Meanwhile, as inadequate as the all-European effort is in terms of competing with the United States, some nations are carrying on their own efforts. France is proceeding with the development of launchers for its missile program, and is also collaborating with Germany in the development of a communications satellite program. Britain is developing a small launcher for research purposes.

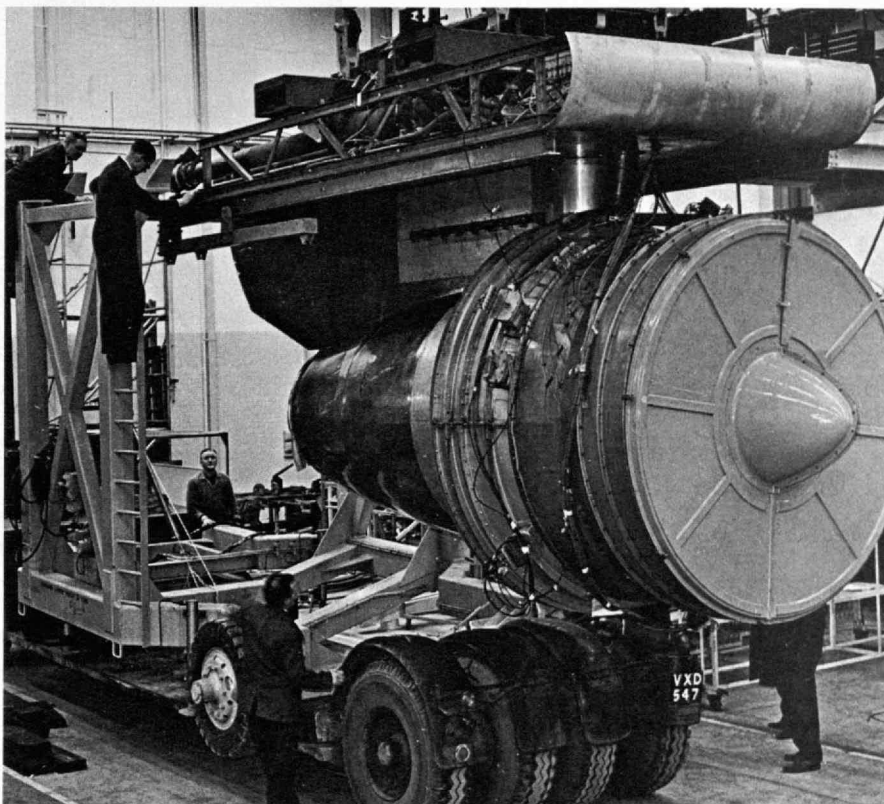
In the field of atomic energy, where the

likelihood of imminent economic payoff is a spur to national efforts, the European-wide program, EURATOM, is now virtually moribund. With most nations putting the bulk of their resources into national programs, EURATOM has crawled through one budget crisis after another and at times has been without any budget at all. EURATOM exists but shows little sign of life.

In aircraft, the Anglo-French *Concorde* supersonic transport project has had its future brightened by sizable delays in the American S.S.T. program. But the project has proved to be so costly that it is not expected to pay for itself. And one reason is that the facade of co-operation is underlaid by a good deal of distrust, which is reflected in the fact that *Concorde* will be built on two complete assembly lines—one in France and one in Britain, though components are being obtained from single sources.

In molecular biology, efforts to establish a European Molecular Biology Organization have run into a variety of difficulties, among them German insistence at one point that German be the official language of the organization—since Germany would be the largest single contributor. Attempts to found a European center for molecular biology have been thwarted, and at present the organization exists essentially as an administrative device for channeling funds to various existing national centers for molecular biology.

The most successful example of European co-operation in big science is CERN, the high-energy physics center near Geneva. CERN thrives and will, by any resource expectation, continue to do so for years. But CERN is not without the problems that have caused difficulties for other European co-operative efforts. Last spring, Britain announced that it would not contribute to the construction of the 300-GeV accelerator that CERN has long planned as a successor to its present 28-GeV machine. Britain cited economic reasons for its decision and expressed the hope that eventually it would become a contributor to the machine. The immediate effect was to require a scaling



One major current European success in the U. S. market is the Rolls-Royce RB.211 advanced technology jet engine, to be used in Lockheed's TriStar airliner. Exceptional in power and compression ratio, and unusually quiet, it is seen here on its way to a high-altitude test chamber.

down of the designs to fit within a reduced budget. And, though the prospects are considered bright, CERN is yet to piece together the financial commitments needed to assure adequate funds for even the cut-price machine.

Science and Economic Viability

That Europe is not succeeding in most of its multinational efforts is quite clear. And the reasons are clear: first comes political unity, and then comes scientific and technological unity. But not so clear are the implications of the failure. Where it counts economically, here and now, such as in iron, steel, and coal, Europe has seen the necessity for co-operation and has worked out the needed political underpinnings. A rash of cross-boundary mergers among various other major industries also suggests that when the economic writing is clearly to be seen, steps toward economic viability readily follow, whether on a governmental or

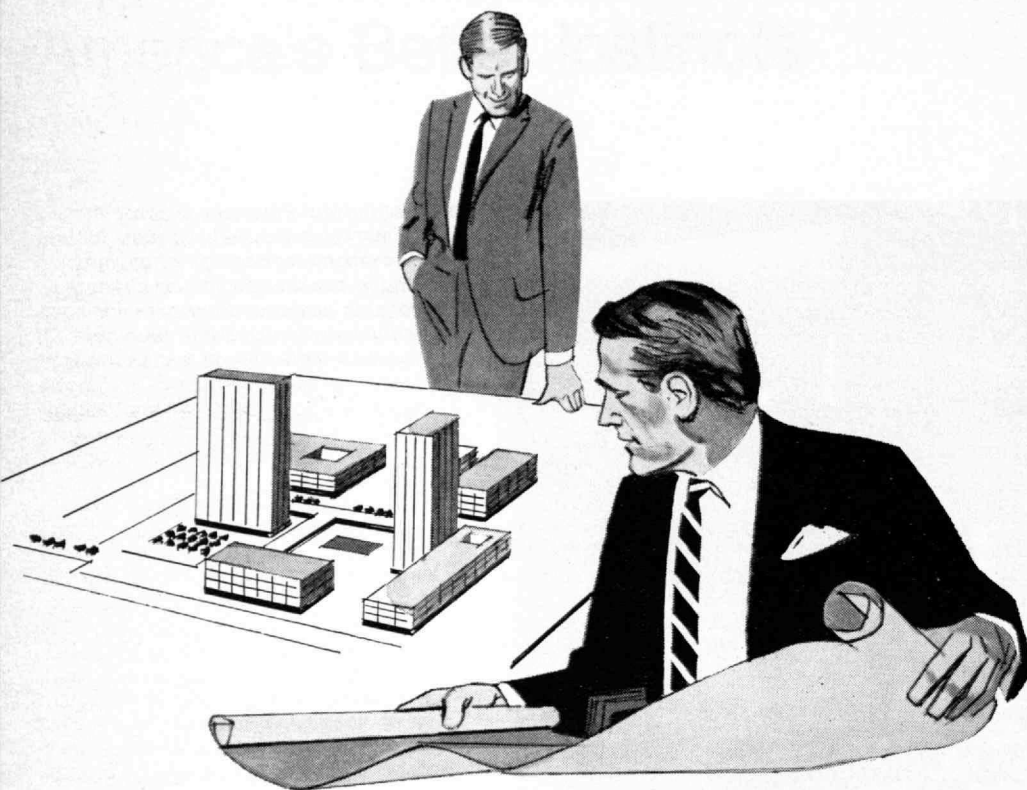
on a private basis. In the case of space, atomic energy, and molecular biology, however, a common theme has been uncertainty either about the prospects of a payoff or the necessity for international co-operation to achieve that payoff. When all the costs are added up, space is yet to turn a profit for any country. In atomic energy, individual nations have reached the stage of building reactors on their own, though the costs have been staggering. And molecular biology, because of its relatively small costs, can get along on national budgets, thus voiding the incentive for co-operation that brought the physicists together at CERN.

A separate, but very important question, is the effect that Europe's faltering co-operative efforts have on the United States. If, as Senator Fulbright argues, power invites arrogance, then it might be argued that Europe's difficulties are not likely to contribute to the en-

hancement of America's better instincts. But it is too much to expect the United States to throttle its efforts out of sympathy for Europe's difficulties. If big science and technology are essential to economic growth—and, hence, to Europe's economic independence—it must be recognized that the prescription for success is well understood.

Daniel S. Greenberg, author of The Politics of Pure Science, is based in London as foreign editor of Science.

An Estate in the Making



The personal fortunes we know best are those we are helping to create —this young corporate executive, as an example, has turned to the Trust Company for assistance.

He has unusual ability and has advanced so rapidly in his company that he is certain to be in the top management group. His executive compensation is already substantial.

His investments are taking too much of his time, so he has turned them over to us to manage. His growth pattern calls for a larger home, or one differently located; we will help to finance it.

For various reasons that include financing stock options, he would like to combine his loans here and borrow considerably more—to which he is amply entitled.

We think this executive will go a long way and we intend to go the full distance with him—and *his family*.

UNITED STATES TRUST COMPANY
OF NEW YORK

45 Wall Street • Telephone 212-425-4500

A Metaphor for the Times

The Theory of the Avant-Garde

Renato Poggioli
(Cambridge, Harvard University Press,
250 pp., \$6.50)

I am coming to believe that if we are to understand the ways of human beings and their societies we must give up our faith, however fruitful it may once have been, in the possibility of "scientific" explanations.

Composed of body and psyche, man is moved to action by hormones and Oedipal urgings. Being an animal, he is aggressive, like the wolf, and territorial, like the coral fish. He is also the economic man, the political animal, even at times a rational creature, and always a living soul, constrained yet free. But attempts to account for his behavior in biological, ethological, psychological, sociological, political, philosophical, or religious terms—or in some combination of these, if such a summation is a meaningful process—should not be seen as explanations. They are concerned with parts, but man is never less than the whole.

Scientists in the practice of the sciences, encircling man in his universe, are like the blind men of the fable, gathered around an elephant, deriving diverse images from a touch of the hand to its trunk or ear or flank or tail. It is evident, I hope, that this is not a denigrating comparison but, in fact, the reverse. It is only because we know what an elephant is like that the old story can be considered a wry parable of human limitation and fallibility. But what if we do not know? Then the blind men's efforts to find out are not pitiable, but wonderfully imaginative.

Nevertheless, a limitation does exist. Much of the world can be apprehended through the senses or their extension by instruments, and described in generalizations of various degrees of abstraction. Very little that is human, however, falls into any such category. The limitation is one of applicability of method: to elephants, yes; to people, no. I am not suggesting that natural and social scientists should abandon the proper study of man, but rather that we should see their work in the proper light. They offer not ex-

planation but a more generous gift, metaphor.

In its essentially poetic relation to truth, metaphor can accommodate ambiguity and contradictions inherent in the human condition that invalidate scientific laws. Even in science (consider phlogiston, the ether, the Bohr atom as examples), a metaphor does not have to be "true" to yield illuminating insights and indicate new directions toward understanding, which can survive an ultimate rejection of the metaphoric framework.

Reflecting on his own experiences as a poet, James Dickey wrote, "The deliberate conjunction of disparate items which we call metaphor is not so much a way of understanding the world but a perpetually exciting way of recreating it from its own parts. . . ." Surely he was speaking not only for poets. It is exciting to find in a recent book a new metaphoric window through which to view a widespread phenomenon in the world today. It is all the more pleasing because the discovery was unexpected.

The chronology of Renato Poggioli's *The Theory of the Avant-Garde* is relevant. The book had its origin in a lecture delivered a quarter of a century ago and first appeared in Italy in 1962, a year before Poggioli's death. It has now been translated by Gerald Fitzgerald, who was a student when the author was Professor of Slavic and Comparative Literature at Harvard.

The term avant-garde, only a little more than a hundred years old, was first used in a revolutionary sense. By 1878, when Bakunin founded an anarchist periodical, it was naturally called "L'Avant-Garde." In the next decade or so, however, the image shifted from the political to the cultural and artistic.

The Avant-Garde in Art

When Professor Poggioli refers to the avant-garde, he means avant-garde art and literature. He roams over the past 75 years but seldom approaches the modern period, choosing as examples in art, chiefly cubism, dadaism and surrealism, and in literature, such figures as Baudelaire, Mallarmé, Rimbaud, Valéry, Apollinaire and Breton. The most recent

critic quoted with any frequency is T. S. Eliot, while such literary innovations as the anti-novel and the theatre of the absurd are mentioned once, in a single sentence.

This preference for earlier times is of no significance. Professor Poggioli is not interested in avant-garde art as a species of art but as "a psychological condition, a unique ideological fact." He is concerned with specific examples only as they provide him with material for the analysis of the avant-garde spirit, mentality, and attitudes.

Neither is it significant that the meaning of avant-garde has shifted back again from the artistic to the political sphere. Professor Poggioli's raw material has been overtaken by history, but his analysis of the avant-garde impulse remains valid, applying accurately and in astonishing detail to a phenomenon barely in existence when he wrote—the new movements in which students, youth groups, and the new left are engaged.

Professor Poggioli defines four "moments" that constitute the dialectic of avant-garde movements: activism, or action for its own sake; antagonism, or hostility to tradition, authority, the public; nihilism, or destruction for its own sake; agonism, or self-sacrifice.

The immediate consequence of avant-garde ideology and psychology for the individual is a state of alienation that has many components—psychological and social, economic and cultural, esthetic and stylistic. This alienation from society becomes the indispensable precondition for the existence of an avant-garde, which can be identified by the four characteristic modes of behavior.

As Professor Poggioli's analysis proceeds from the broad foundation to the fine structure of the avant-garde impulse, it is necessary to remind oneself more than once that his data came, not from today's newspapers, but from the words and doings of Flaubert, Gautier, Oscar Wilde, and similar ancients.

"The innumerable expressions of this antagonism (i.e., toward society) can

be reduced . . . to the lowest common denominator of nonconformism. If the avant-garde has an etiquette, it consists of perverting and wholly subverting conventional deportment. . ."

"What stems naturally from such psychological motivations . . . is that predestined unpopularity which avant-garde followers, lightheartedly and proudly, accept."

"The avant-garde cult of youth. . . Excessive exaltation of youth obviously leads to a regressive condition: from youthful freshness to adolescent ingenuousness, to boyish prankishness, to childishness."

"No one else has expressed that anti-thesis (father-son, the old and the young generation) with Apollinaire's brutal frankness: 'You can't lug the corpse of your father all over the place.'"

". . . the avant-garde . . . can only flower in a climate where political liberty triumphs, even if it often assumes an hostile pose toward democratic and liberal society."

Professor Poggioli's theory of the avant-garde is a remarkable achievement. It yields a model that fits a contemporary social pattern so closely that key images come to mind spontaneously to match his descriptions of avant-garde attitudes and behavior. The hippie style of dress and living . . . never trust anyone over thirty . . . the Yippies (members of the Youth International Party) . . . the cavorting of Jerry Rubin, Yippie leader, at a Congressional committee hearing . . . violence on college campuses . . . four-letter words and a special favorite, twice as long . . . the popularity of Mao, Ho, and Che in New Left circles. . .

James Kunen, nineteen years old, took part in the recent disturbances at Columbia University. His book, *The Strawberry Statement: Notes of a Columbia Revolutionary* (New York, Random House, \$4.95) abounds in sentences that seem designed to illustrate Professor Poggioli's analysis of the avant-garde temperament.

"My father talks about the bad associations people make when they see someone with hair. . . I say great. I want the cops to sneer and the old ladies swear and businessmen worry. I want everyone to see me and say, 'There goes an enemy of the state,' because that's where I'm at, as we say in the Revolution biz."

"I get up and shave with Grayson Kirk's razor, use his toothpaste, splash on his after-shave, grooving on it all."

"I admit I haven't read them [Gandhi and Thoreau]. But Gandhi had no Gandhi to read and Thoreau hadn't read Thoreau. They had to reach their own conclusions and so will I."

The theory of the avant-garde is not binding on Yippies, the new left, or Columbia revolutionaries. It is a metaphor that

provides a perspective and a language with which we may think about the events of our time.

Some Distinctions

So, for example, in terms of Professor Poggioli's metaphor, we may make a set of distinctions. The French students who occupied the Sorbonne were avant-garde; the French workers who occupied the factories were not. The Yippies who demonstrated during the Democratic Convention in Chicago were avant-garde; if Communist Party members participated in the demonstration, they were not. The Students for a Democratic Society who took over Columbia University buildings were avant-garde; the black students barricaded in Columbia's Hamilton Hall were not.

The essential criterion is alienation. The French workers are not alienated from society; they want a greater share in it. Communists want to take it over. Black students are not alienated, they are barred, from society. To those we are now calling avant-garde, however, alienation is a consciously felt state, often deliberately sought.

The distinctions are real enough to the participants so that the French workers refused to let the students join their march, Communists have been conspicuously silent about the New Left stirrings of youth, and black students have turned away white sympathizers, with the admonition that they do their own thing.

By the same criterion, avant-garde art is becoming a rare phenomenon. Extremes in art and literature are widely accepted, or at least tolerated, audiences are larger, patrons, both public and private, are more numerous and more generous. The barriers between art and society are weakened, artists as artists find it more difficult to maintain the essential state of alienation.

The avant-garde mantle has fallen upon the willing shoulders of the young.

So far metaphor can take us. But it is necessary to look beyond symbol to content. André Breton defined "a volley shot into a crowd" as the "surrealist act, par excellence." He never fired into a crowd; he did not mean that a volley should actually be shot. He was using verbal violence to elucidate the ultimate meaning of surrealism—and to practice the avocational commandment: *épater la bourgeoisie*. At the same time, however, he was following his vocation of painting and writing, for the sake of which he was engaged in the avant-garde, surrealist attack on society.

The contemporary avant-garde takes its symbols literally. It expresses itself in general opposition to society, in opposition for its own sake rather than for some political or social or esthetic end. The movements we have called avant-garde have no Bretons, no Picassos, no Joyces, no Bakunins, no ideas, no ideals more meaningful than slogans. They dis-

play the formal manifestations of the avant-garde impulse with none of the justifying content.

How ironic that form without content is precisely the quality of contemporary society against which the avant-garde impulse should be directed.

In Brief

Unlike most legends, the story of Atlantis has a known and respectable source. Plato described the city and told how it disappeared into the sea, but failed to identify the site. James W. Mavor, Jr. (M.I.T.'44) believes that Atlantis was a Minoan settlement on the volcanic island in Thera in the Aegean, not far from Crete. *Voyage to Atlantis* (New York, Putnam, 320 pp., \$6.95) is an account of his expedition to search for the lost city, using modern equipment, including the "mud pinger", a sonar device developed by Professor Harold Edgerton, who was a member of the party.

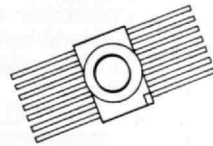
Mr. Mavor appears to have found the remains of a Minoan city, which, he claims, was Atlantis. Such an identification involves some semantic confusion. Thus, for example, Schliemann discovered, not Homeric Troy, but a series of cities in a place and of a type such that one (or more) of them might have been the Troy about which Homer (or another poet of the same name) wrote an epic tale, which might have been based on historical events.

But never mind. Stories, real or fictional, about searches for lost cities have a built-in appeal.

Chagall: Unpublished Drawings (Geneva, Skira, distributed by World Publishing Company, 95 pp., \$7.50), with text by Jacques Lassaigue, is another of the beautifully designed books in the series, *The Taste of Our Time*. The drawings, some with touches of color, are entirely spontaneous in feeling, personal, almost autobiographical. The text, in keeping with this mood, relates the circumstances under which the drawings were made. The book reveals the range of Chagall the man, as well as the artist.

Joseph Mindel is Secretary of the Steering Committee of the M.I.T. Lincoln Laboratory.

The Generation Gap



We bridge it.

Miniature circuits and magnetic cores brought in a new generation of computers. They also brought the potential of new profit opportunities for management.

But, for most computer buyers, the profit potentials have not been realized. There was too much technology too soon. The third generation is largely underemployed.

That's where we come in.

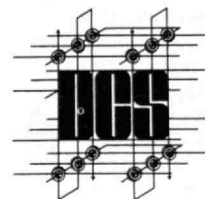
Davis Computer Systems, Inc., bridges the gap between the new computer technology and its application. We're third-generation computer systems engineering contractors. Presently providing complete, on-line computer systems and services. Already planning ahead to the fourth generation.

And DCS can assist you in putting the new generation to work. Whether your problem is getting an industrial control system on line. Or setting up a company-wide hierarchy of computers to monitor and control

everything from raw-materials procurement to product distribution. And, on the level of corporate computer systems, we also provide consultation services to help implement profitable applications.

DCS has its own library of applications software which can be put to work for you. We also provide AL/COM Computer Time Sharing Services using the Applied Logic Dual AL-10 system.

What counts more is our depth of experience. It means that DCS is ready now to help you collect the profits that can be yours when you successfully bridge the generation gap. For more details, call or write:



Robert S. Davis, Sc.D., Course X
President,
Davis Computer Systems, Inc.
280 Park Avenue
New York, N.Y. 10017
Tel.: (212) 867-6406



ELECTRONICS: BJTs, FETs, and Microcircuits

E. J. ANGELO, JR., formerly of Polytechnic Institute of Brooklyn. *McGraw-Hill Electrical and Electronic Engineering Series. Brooklyn Polytechnic Institute Series.* Available Spring, 1969.

Divided into two parts, the first half of this text is concerned primarily with elementary electronic circuits and the internal physics of the electronic devices used in them. The second half studies more elaborate amplifier circuits and concentrates on analytical techniques and circuit design.

DIGITAL COMPUTER FUNDAMENTALS, Second Edition

THOMAS C. BARTEE, Harvard University. 480 pages, \$6.95.

Presents a broad treatment of the subject, starting with digital computers, some details on programming and a description of the basic circuits, and concludes with the organization and operation of complete digital machines.

ALGEBRAIC CODING THEORY

ELWYN R. BERLEKAMP, Bell Telephone Laboratories. *McGraw-Hill Series in Systems Science.* 480 pages, \$17.50.

Covering the best error-correcting codes proposed to date, this book includes detailed discussion of the known properties of these codes as well as an exposition of the best known decoding algorithms. Special emphasis is placed on the design of the decoder.

DYNAMICS OF PHYSICAL SYSTEMS

ROBERT H. CANNON, JR., Stanford University. 912 pages, \$13.25.

This text carefully treats the modeling of physical systems and derivation of their differential equations of motion and then determines the physical behavior that those equations connote. Also covered are dynamic stability, coupling, and natural behavior, etc.

COMMUNICATIONS SYSTEMS: An Introduction to Signals and Noise in Electrical Communication

A. BRUCE CARLSON, Rensselaer Polytechnic Institute. *McGraw-Hill Electrical and Electronic Engineering Series.* 460 pages, \$13.50.

The focus in this text is upon those concepts, techniques, and problems which characterize information transfer via electrical signals, given the inevitable limitations of physical systems. Although the material is presented in the context of communication systems, the basic subject matter is information-bearing signals in linear systems.

DYNAMICS OF MECHANICAL AND ELECTROMECHANICAL SYSTEMS

STEPHEN H. CRANDALL and **DEAN C. KARNOPP**, both of the Massachusetts Institute of Technology; **EDWARD F. KURTZ JR.**, Joseph Kaye & Company; and **DAVID C. PRIDMORE-BROWN**, Aerospace Corporation. 480 pages, \$13.50.

This book develops and applies dynamic analysis procedures for studying mechanical, electrical, and electromechanical systems. An unusual feature is an emphasis on mixed systems. As examples the book treats: systems with both lumped parameter and continuous elements; systems with both mechanical and electrical elements; and systems with both solid and fluid elements.

FUNDAMENTALS OF APPLIED PROBABILITY THEORY

ALVIN W. DRAKE, Massachusetts Institute of Technology. *McGraw-Hill Series in Probability and Statistics.* 304 pages, \$9.75.

This particularly readable text, with coverage through Markov processes and introductory statistics, develops applied probability theory using a relatively physical, unsegmented approach. Emphasizes the sample space formulation of probabilistic situations.

MULTIPLE-INPUT DESCRIBING FUNCTIONS AND NONLINEAR SYSTEM DESIGN

ARTHUR GELB, The Analytic Sciences Corporation and **WALLACE E. VANDER VELDE**, Massachusetts Institute of Technology. *Electronic Sciences Series.* 655 pages, \$15.50.

Two special features are: a theory of quasi-linearization for the approximate study of the behavior of nonlinear systems (within the context of this theory the original sinusoid-input describing function and all useful multiple-input describing functions are derived) and a complete documentation of the application of describing function theory to the analysis and design of nonlinear control systems is provided.

DIGITAL PROCESSING OF SIGNALS

BERNARD GOLD and **CHARLES M. RADER**, both of the Massachusetts Institute of Technology. *Lincoln Laboratory Publications.* Available Spring, 1969.

The overall purpose of this text is to introduce and develop the theory behind modern digital signal processing techniques; emphasizing the theory of digital filtering, via frequency-domain description, and discrete spectrum analysis. This theory can then form the basis of either computer programs or hardware realizations for waveform processing.

DIGITAL COMPUTER SYSTEM PRINCIPLES

HERBERT HELLERMAN, New York University and Senior Systems Consultant, IBM. *McGraw-Hill Computer Science Series.* 424 pages, \$13.50.

The principles of general purpose digital computer machines—organization and programming includes programming, storage organization, logic and logic circuits, number representations and arithmetic operations, addressing and instruction sequencing, an example system (the IBM System/360) and reliability theory.

RADIATIVE TRANSFER

H. C. HOTTEL, and **A. F. SAROFIM**, both of the Massachusetts Institute of Technology. *McGraw-Hill Series in Mechanical Engineering.* 520 pages, \$15.50.

Radiative Transfer gives the first rational treatment of heat transfer in combustion chambers, with allowance for the effects of gas temperature gradients, non-gray gas and complex configurations. It covers the fields of surface radiation, gas radiation, and radiative scatter.

CATALYSIS IN CHEMISTRY AND ENZYMOLOGY

WILLIAM P. JENCKS, Brandeis University. *McGraw-Hill Series in Advanced Chemistry.* 576 pages. Available in March.

An advanced text and reference book that describes principles and mechanisms of catalysis of reactions in aqueous solution that are pertinent to the mechanisms of catalysis by enzymes. This is the first text which contains an extensive discussion of

McGraw-Hill Book Company

interactions in water through hydrogen, electrostatic and hydrophobic bonds and charge transfer forces, as well as an up-to-date review of the mechanisms of carbonyl and acyl group reactions.

TOPICS IN MATHEMATICAL SYSTEM THEORY

RUDOLF E. KALMAN, Stanford University; **PETER L. FALB**, Brown University; and **MICHAEL A. ARBIB**, Stanford University. *International Series in Pure and Applied Mathematics*. 384 pages, \$16.50.

A modern survey of the most recent advances in system theory, this text emphasizes rigorous mathematical methods. It may be used as a text or supplement in courses on mathematical system theory. Much important material (for instance, the theory of controllability and the structure of dynamic systems) is covered from different points of view by all three authors.

SWITCHING AND FINITE AUTOMATA THEORY

ZVI KOHAVI, Massachusetts Institute of Technology. *McGraw-Hill Series in Computer Science*. Available Winter, 1970.

The author's purpose is to develop topics which are the product of recent research and are of practical interest to the logical designer and the computer scientist. Provided are techniques for minimizing or decomposing combinational as well as sequential circuits, techniques for diagnosing logical circuits and for designing fault-detection experiments, etc.

INTRODUCTION TO COMBINATORIAL MATHEMATICS

C. L. LIU, Massachusetts Institute of Technology. 448 pages, \$13.50.

Four aspects of combinatorial mathematics are covered in this text: enumerative analysis; theory of graphs; optimization techniques; and design of experiments. The discussion combines fundamental theory with modern applications, with basic concepts unencumbered by excessive mathematical detail.

PARTICLE PHYSICS: The High-Energy Frontier

M. STANLEY LIVINGSTON, Massachusetts Institute of Technology. 256 pages, \$5.50 clothbound; \$3.25 soft cover.

The purpose of this book is to present a brief survey of the pertinent facts, terminology and concepts in the new field of research called particle physics. It is intended specifically for the beginning student who wants to know what is happening in this field, and for the college teacher who wishes to be up-to-date in modern physics.

THEORETICAL ACOUSTICS

PHILIP M. MORSE and **K. UNO INGARD**, both of Massachusetts Institute of Technology. *International Series in Pure and Applied Physics*. 960 pages, \$23.00.

Provides a unified treatment of acoustical phenomena in fluids—with special emphasis on recently developed mathematical techniques and applications. The mathematics required for studying the material is developed in detail and is then applied to a wide range of problems on acoustic radiation, transmission, coupling, and scattering.

PROGRAMMING SYSTEMS AND LANGUAGES

SAUL ROSEN, State University of New York, Stony Brook. *McGraw-Hill Computer Science Series*. 392 pages, \$12.50.

Published and unpublished reports describing the most important programming languages and discussing important programming systems concepts: ALGOL, FORTRAN, COBOL, PL/1, IPL-V, COMIT, LISP, SLIP, SNOBOL; compilers and compiling techniques; assembly systems and operating systems.

CHEMISTRY FOR SANITARY ENGINEERS, Second Edition

CLAIR N. SAWYER, Metcalf and Eddy, Engineers, Boston and **PERRY L. McCARTY**, Stanford University. *McGraw-Hill Series in Sanitary Science and Water Resources Engineering*. 544 pages, \$13.50.

Part I discusses fundamental concepts from the various branches of chemistry which serve as a basis for sanitary engineering practice. Part II covers the basic chemistry and practical applications of 24 different analytical tests of major significance in water quality evaluation and water pollution control.

PHYSICS OF NEGATIVE VISCOSITY PHENOMENA

VICTOR P. STARR, Massachusetts Institute of Technology. *McGraw-Hill Earth and Planetary Science Series*. 224 pages, \$9.95.

Presents the first available discussion in book form of the actual existence of a negative turbulent viscosity in fluids under certain circumstances. A simplified treatment makes this new valuable information accessible to readers with a background in classical physics who do not have a specialized knowledge and competence in hydrodynamics.

THE STRUCTURE OF PROBABILITY THEORY WITH APPLICATIONS

ARAM J. THOMASIAN, University of California at Berkeley. 832 pages. Available in June.

This book may be used by juniors, seniors, and graduate students from many fields. The first five chapters are a self-contained presentation of sets, functions, etc. The remainder of the book covers the discrete and then the continuous case in an explicit manner with a gradual orientation designed to make the modern measure-theoretic formulations seem natural and palatable.

PROGRAMMING LANGUAGES, INFORMATION STRUCTURES, AND MACHINE ORGANIZATION

PETER WEGNER, Cornell University. *McGraw-Hill Computer Science Series*. 408 pages, \$10.95.

Develops in depth a unified framework for the study of programming languages. Permits the treatment of such languages and systems in a coordinated and systematic way.

SOLID STATE BIOPHYSICS: Applications of Electron Spin Resonance, Dielectric Measurements, the Mossbauer Effect, and Lasers to Biology and Medicine

Edited by **SIDNEY J. WYARD**, Guy's Hospital Medical School, University of London. *Advanced Physics Monograph Series*. 384 pages, \$12.00.

This graduate-level text and reference book presents important, recent research findings and explores the future potential of each investigative method. Each section is written by a contributor working actively in the field. The material is easily comprehended by anyone who has an undergraduate degree in physics.

SYSTEM THEORY

E. A. ZADEH and **E. POLAK**, both of the University of California, Berkeley. *Inter-University Electronics Series*. Available Spring, 1969.

Covers the most important areas in system theory through a collection of articles prepared by experts in their respective fields. While the material is not restricted to any particular field, the techniques presented are broadly applicable to many types of systems: linear, nonlinear, discrete, finite-state, etc.



Scared?

What would you do if something in your plant suddenly exploded? One explosion could trigger others, fire could follow until your thriving plant were virtually flattened. Does your present insurance provide adequate protection?

Talk to an Arkwright-Boston man. He'll tell you about complete cover-

age. He'll explain to you how you can be insured against industrial loss — how a potentially disastrous situation might be prevented.

Arkwright-Boston programs are designed for your particular needs. Our men are specialists — trained and ready to help you.

Remember: industrial loss is expen-

sive; by comparison the cost of protection is low. Don't wait until tomorrow to look into complete coverage. Call or write today.

Arkwright-Boston Insurance

Executive offices: 225 Wyman St., Waltham, MA 02154
Arkwright-Boston Manufacturers Mutual Insurance Company
Mutual Boiler and Machinery Insurance Company
Factory Mutual Insurance



Offices in thirty major cities throughout the United States and Canada.

It is now clear that methods of systems analysis, supported by high-capacity digital computers, can achieve true understanding of complex social as well as technological systems

Jay W. Forrester
Professor of Management
Sloan School of Management, M.I.T.

A Deeper Knowledge of Social Systems



When considering the computer in society, one could ask, "How can man improve his understanding of the computer so as to make the computer better serve society?" But here the perspective will be reversed to ask, "How can the computer improve our understanding of society, so that society can better serve man?"

Man neither understands nor has mastery of his social systems, as a glance at the newspapers will testify. More technically, we fail to understand social dynamics—how our social systems change with time, and how their behavior depends on their structures and on the policies at work within them. Toward a better understanding of human systems, we have at the Sloan School for the last 12 years been developing "industrial dynamics." But that title has become a misnomer. The theory and concepts we employ describe the dynamics of systems in general—not merely managerial systems but all systems. Our work focuses on the principles of systems, principles that apply to any system whose condition changes with time. The principles cover systems in physics, engineering, management, economics, medicine, and politics—wherever interactions between components change the condition of the system as it progresses from the present into the future. The universality of the principles underlying the structure and dynamics of systems gives our students a very remarkable mobility. They can readily move between fields as different as engineering, public health, ecology, and management. This mobility is possible because important and useful principles apply equally well to controlling chemical processes, guiding space ships, and working out policies within our social systems.

To illustrate this generality, let me now describe some principles governing structure in systems and then show how these principles can be used to examine the dynamics of growth, decline, and revival of an urban area.

Orderly and universal concepts of structure apply throughout all systems. Most fundamental is the

concept of the feedback loop. Indeed, all decisions are embedded in feedback loops. All processes of growth and goal-seeking are governed by feedback loops. All interactions that cause change through time occur within feedback structures. The simplest possible feedback loop (Figure 1) illustrates the basic structure. Here the "rate" is a statement of policy that tells how the available information is processed to generate a flow that changes the "level" or condition of the system. As the condition (level) changes, it presents new information to the policy (rate) to change the flow to further change the level. The process is continuous and circular.

To illustrate, Figure 1 can describe the process of filling a glass under a faucet. The rate variable describes the water flow. The level variable is the water level. The level of water is being controlled by the rate of flow, and the rate of flow is being controlled by the level. As one watches the level, he adjusts the faucet to control the rate of flow based on the level and how full he wants the glass. The information part of the loop from glass to eye to hand to faucet is usually overlooked. We are often not aware of the circular structure within which our actions take place. All decisions occur within a feedback loop structure, whether the decisions are public or private, conscious or subconscious.

Figure 1 illustrates a general truth about systems. They are composed of two and only two kinds of variables—the rates and the levels. The rates are instantaneous, algebraic relationships that describe how the levels influence the flows. The levels are the accumulations of the rates of flow, and are generated by integration over time.

Differentiation Is Unreal

Integration is the fundamental process by which change occurs in all systems. Integration, not differentiation, is the time-dependent process in dynamic systems. This may be surprising to engineering readers; in our educational system differential equations and the mathematical notation

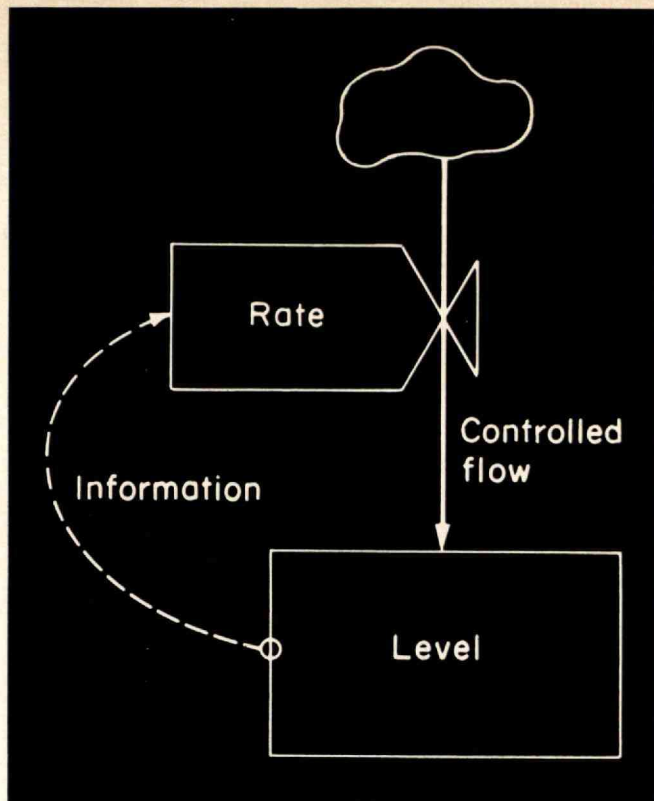


Figure 1. The simplest possible feedback loop, having one rate and one level.

for differentiation are deeply entrenched. But there is in fact no place in nature or society where the process of differentiation occurs. Differentiation is a figment of the mathematician's imagination; it has no reality. All of the processes of physics and of social systems integrate, or accumulate. In a swinging pendulum, acceleration is integrated into velocity, and velocity is integrated into position, even though the equations are usually written as derivatives. Indeed, the concept of differentiation, when its unreality is not fully understood, misleads many students. It tends to create a reversed sense of causality. Returning to the filling of a glass of water, if one expresses the rate of flow as the derivative of the water level, as is commonly done, one is perilously close to saying that the water is flowing because the water level is changing. As more complex systems are encountered, the danger of failing to see the direction of causality increases, unless the flow-diagram structure and mathematical notation are made to agree with the processes in the actual system.

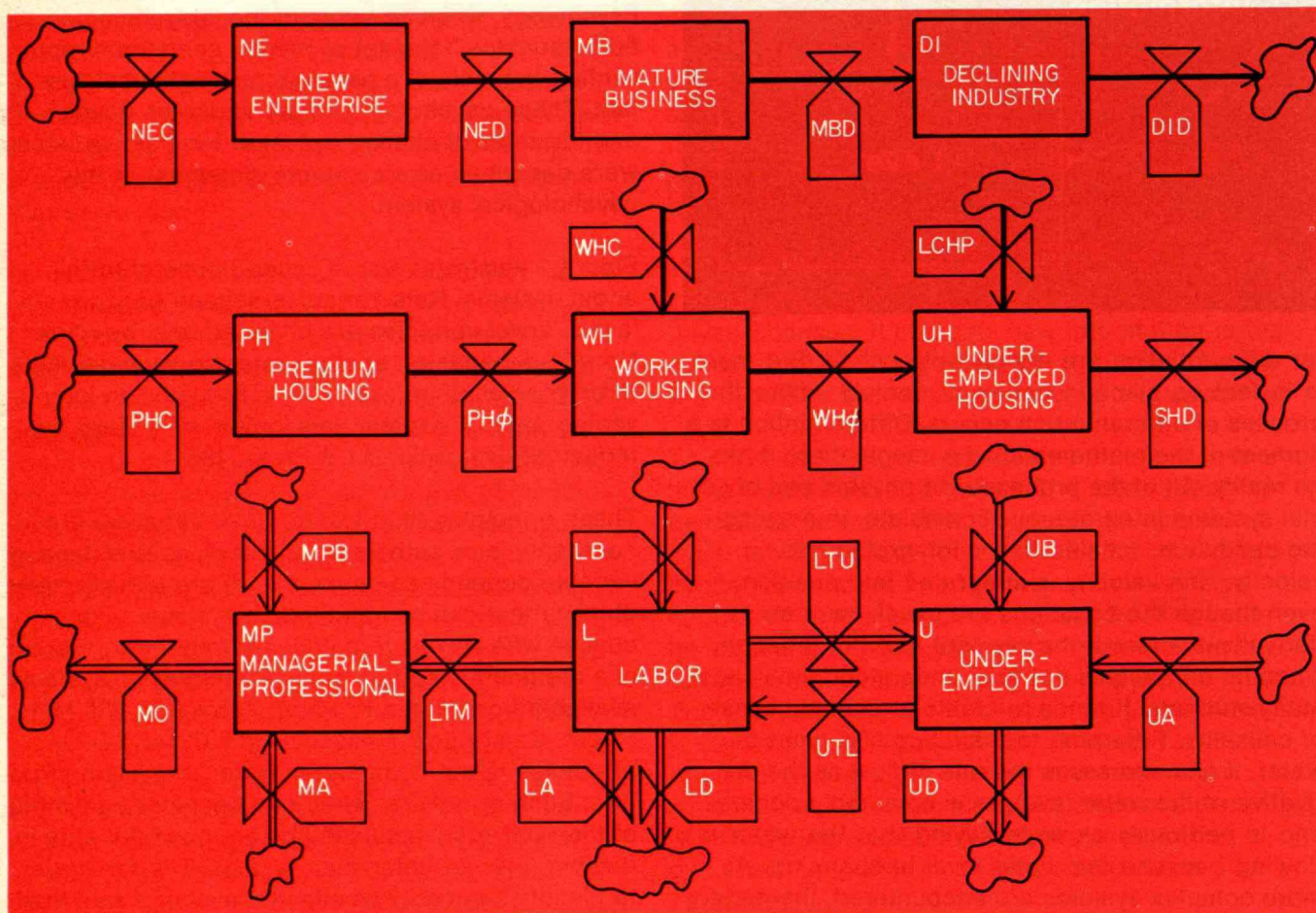
That two kinds of variables (levels and rates) are necessary and sufficient in a system has been recognized in several fields. For example, the difference between levels and rates is clearly recognized in financial accounting; the balance sheet variables are kept strictly separate from the profit-and-loss sheet variables. The balance sheet variables are levels (or state variables); the profit-and-loss variables are rates. Also, the distinction between rates and levels was formulated in psychology here at M.I.T. by Kurt Lewin, Professor of

Psychology, when he wrote of the "psychological field variables," the set of mental conditions representing the state of a person's psychological system. These psychological field variables (levels) and the rates of change (rates) in the field variables were described as a complete statement of the psychological system.

Figure 1 illustrates also a second general truth about systems. Rate variables depend only on levels. Level variables are changed only by rates. No rate depends on another rate. No level depends directly on another level—there has to be an intervening rate (I explain this point more fully in *Industrial Dynamics*, M.I.T. Press, 1961).

These principles (that two kinds of variables are necessary and sufficient, and that neither type of variable depends on its own kind) are but examples of many that can be identified in systems. (For anyone who wishes to go deeper into these, there is a preliminary edition of my *Principles of Systems*, available from Naren K. Patni, Room 516, 238 Main Street, Cambridge, Massachusetts 02142.) Other principles relate dynamic behavior to system structure. Such principles, when one becomes convinced of their universal applicability, are powerful aids in dealing with an unfamiliar system. It is far easier to identify a quantity as either a level or a rate than to ponder which of an unknown number of categories it might belong to. Knowing the relationship between levels and rates, and anticipating the feedback loop structure (even though the structures are far more complex than Figure 1) helps to organize our observations about systems. Principles that are universal from physics to psychology and from economics to ecology give a man mobility by providing a common foundation from which to perceive all dynamic behavior.

Engineers have studied and worked with feedback (or control, or servomechanism) systems for several decades. But engineers have usually not seen the full generality of the feedback process. Feedback control has often been defined as limited to physi-



cal equipment where small signals control large flows of energy, without recognizing that the same structures, the same modes of behavior, and the same dynamic principles apply wherever changes occur through time.

Thinking Too Simply

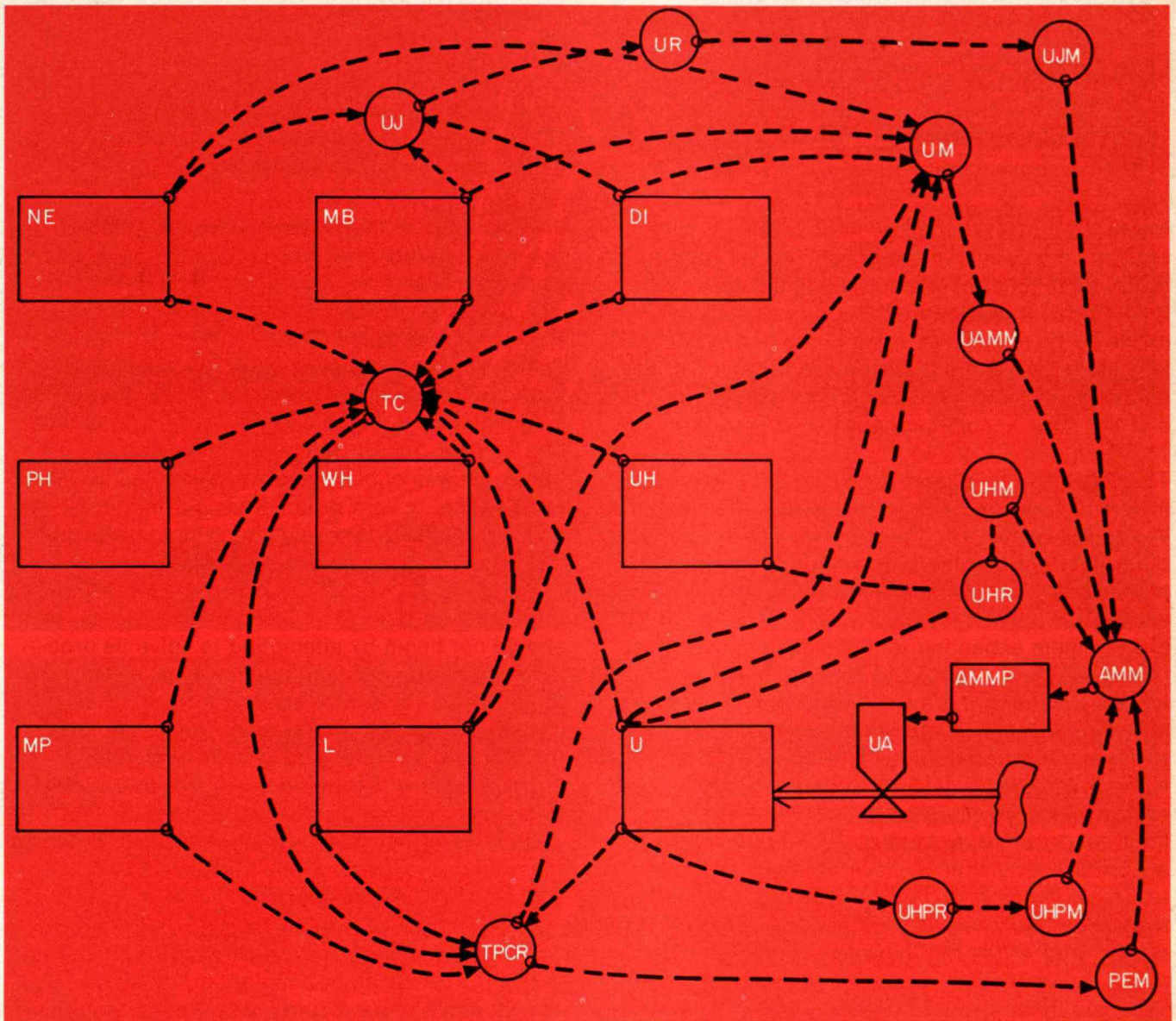
Because of inability to obtain mathematical solutions to problems relating to complex systems, engineers developed the differential analyzer and later the digital computer. These computers manipulate models which represent the real system in which we are interested. But models were not first created by or for computers. Models have been used as long as man has been able to think. Mental

images in thinking are models. Such images are not the real system, they are abstractions that stand for, represent, or simulate the real system. Computer models differ by being more explicit than mental models. They are more useful for communication because they are less ambiguous than descriptions in words.

In addition, computer models of feedback systems can show the dynamic consequences of interactions between components of the system—an ability almost totally lacking in our mental processes. We can be sure that a computer is showing correctly the consequences that follow from the assumptions it is fed. But the mind refuses the task, or

Figure 2. (opposite page). The major levels (rectangles) and rates (valve symbols) for the model of an urban area. Reading from the top, the levels modeled are the amounts of different classes of business, housing and people. Flow rates are shown, but not the influences controlling them.

Figure 3 (below). A typical set of influences controlling one of the flow rates in Figure 2. This diagram shows how the levels in all parts of the system govern the rate of arrival of under-employed people (lower right).



worse, is usually wrong, when it attempts to estimate the dynamic behavior of a system having a given structure.

In technology, where systems are comparatively simple, engineers have long ago recognized that understanding must be based on models, now usually computer models. But in social systems, with their far greater complexity, we still attempt intuitive solutions to give dynamic behavior.

However, intuition is unreliable. It is worse than random because it is wrong more often than not when faced with the dynamics of complex systems. There are reasons why intuition leads to error. Our

intuition has been built up over a lifetime of immersion in the simplest possible feedback loops. A baby in turning his head toward a light source gains his first experience with the simple type of feedback loop which operates on a discrepancy between a goal—where the light is—and a condition of the system—where the head is. From then on, every learning process takes place within the context of simple feedback loop structures. But this learning process is misleading in two ways. Firstly, even the simple feedback structures are perceived incorrectly. Secondly, the behavior of the simple systems that we learn to understand is in many ways quite the opposite of that of complex systems. We tend to perceive incorrectly even the simplest

Figure 4 (top, right). Urban development, maturity and stagnation, showing the major levels during the urban life cycle.

Figure 5. (bottom, right). Important ratios as they change during the life cycle in Figure 4.

loop structures. We think of A as causing B without realizing that B is also causing A. That is, we think of uni-directional cause and effect linkages rather than the feedback loop structure that actually exists. For example, we think of the faucet controlling the water in the glass but do not think of the faucet at the same time being controlled (through our sight and action) by the water in the glass.

The conditioning acquired from simple systems misleads us in the realm of complex social systems. We do not realize that the behavior of a system is determined primarily by its structure and (rates) policies, and not by incidents of the A-causes-B variety. Complex systems are diabolical. We approach them expecting to find simple cause-effect relationships to explain the troubles in a system. Not only is there no simple cause—the “cause” is in the structure, and in the interactions of components interrelated in complex ways—but even worse, the system deludes us into a sense of false security by presenting apparent cause-effect pairs that match our expectations. Such apparent causes are usually only coincident symptoms; they are not leverage points through which the behavior of the system can be corrected. In fact, the “obvious” correction exerted on the apparent cause will often make matters worse.

This counter-intuitive behavior in complex systems appears repeatedly in management systems. In our research we often examine the interactions within a corporation with a clearly recognized set of troubles—like fluctuating employment, falling market share, or low profitability. In such situations, one usually finds that people are quite aware of their actions, their response to pressures and their efforts to correct the troubles. By careful examination, we ordinarily find that people are in fact doing what they believe they are doing. One can then build a system model from these known practices that are governing behavior and show that the known practices, in fact the very things being done to solve the problems, are sufficient to cause the troubles. The consequences of

the practices as they interact with one another are very different from those predicted by intuition and judgment.

How to Look at Cities

The contrary nature of complex systems is illustrated by my recent examination of the growth, stagnation, and revival of a city (*Urban Dynamics*, M.I.T. Press, 1969). The study shows that the depressed areas of our cities are generated by the policies that govern urban areas. Furthermore, the actions intended to relieve the symptoms of urban distress can often make matters worse.

In examining a social system such as a city, one should not begin by attempting to solve its problems. First, one must identify the system structure that creates the undesirable symptoms. Unless the underlying causal relationships are understood and altered, any efforts to relieve symptoms struggle against the still-present forces that continue to work toward undesirable ends. In fact, efforts merely to treat symptoms usually increase the counterpressures within the system and neutralize the corrective efforts.

So, if one wishes to redesign urban policies with the aid of a computer simulation model, the model should contain the processes that generate urban blight. Only then, with the causal interactions present, can corrective policies be reliably evaluated. A proper model will be able to start with empty land, show the growth of a city, and reproduce the aging sequences as slums develop.

In addition to incorporating the processes that create the troubles, the model's construction should follow another guiding principle. It should be a model of the *general* urban life cycle, not a model of a specific city. The general model will be simpler and clearer than a specific model. It focuses on the processes that are common to all slum areas whether now or in the past, in the United States or elsewhere, New York or a gold rush camp. It avoids the peculiar facets of individual situations which,

Figure 6 (below). Construction of low-cost housing each year for about 2.5 per cent of the underemployed (starting at the end of the life cycle already shown) causes, deterioration in most of the system's conditions.

Figure 7 (top, right). Again starting at the end of the life-cycle, the demolition of 5 per cent of the underemployed housing each year, together with business encouragement that increases the construction of new enterprises by 40 per cent above that which would otherwise have occurred for the same conditions, causes an economic revival, with improved job opportunities for the underemployed.

Figure 8. (bottom, right). The changes in underemployed/job ratio, the underemployed/housing ratio, and the tax ratio that result from the changes shown in Figure 7.

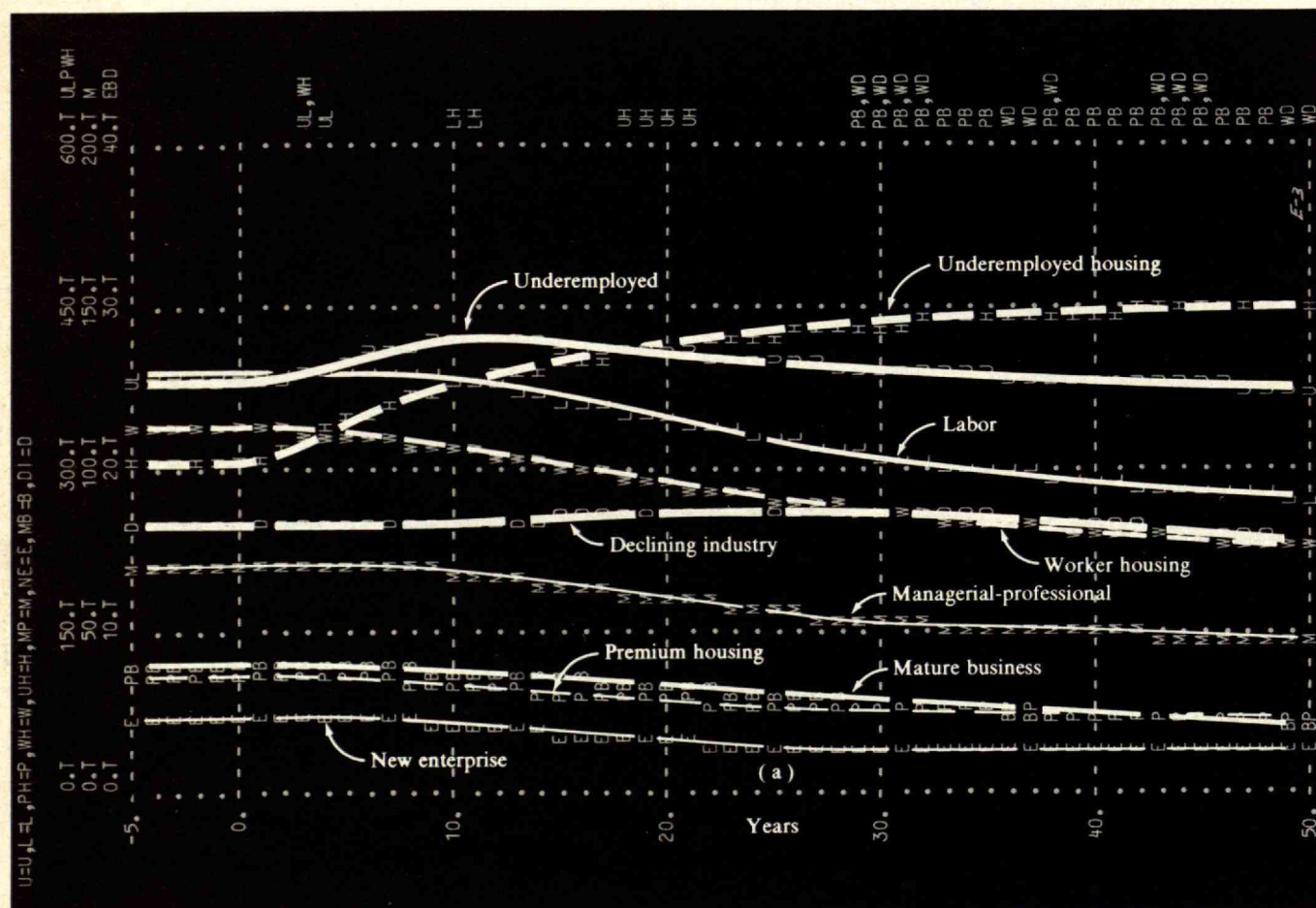
because they can sometimes be missing, must not be an essential part of the urban decay process.

Figure 2 shows a model structure for studying the life cycle of an urban area. The model contains two kinds of variables—nine level variables represented by rectangles and 22 rate variables represented by valve symbols. The rates cause the levels to change as shown. The levels control the rates of flow through "information" connections (in the sense of Figure 1) too complex to show on this diagram.

This representation of a city contains three main subsystems, shown one below another. Across the top is the industrial sector that generates new

enterprise, and causes it to age progressively into mature business, then declining industry, and finally demolition. In the center is the housing sector, which builds three categories of housing and, by aging, causes structures to move from the left-hand toward the right-hand categories and finally to be demolished. The lower subsystem generates the movement of people to and from the urban area and between economic categories of population.

Figure 3 shows the kind of information linkages that were omitted from Figure 2. In Figure 3 the dotted lines connect the system levels to just one of the 22 flow rates, here the rate of arrival of underemployed into the urban area. A similar network con-



trols each of the other 21 rates of flow. In the figure the arrival rate depends on the underemployed/job ratio (U.R.), the upward economic mobility from the underemployed to the labor class (U.M.), the underemployed housing ratio (U.H.R.), the low-cost-housing construction rate (U.H.P.R.), and the public expenditure ratio (P.E.M.). The underemployed-arrival rate depends on the condition of the industrial sector describing the available jobs, on the housing sector, and on the conditions within the population sector.

The City's History

Figure 4 shows a 250-year urban life cycle generated by the computer model. It starts with nearly empty land, generates growth and the filling of the particular land area, and then emerges into a final equilibrium stagnation. The 100th year is about the end of the growth period with the peak in new enterprise about equal to the amounts of mature business and of declining industry. At that time the underemployed population is half the labor population. But at the 250th year, underemployed population has risen and labor has fallen until the two are equal. Declining industry has risen to dominate the industrial scene compared to new enterprise or mature business.

Figures 2 and 4 help show the underlying reason for decline of an urban area. During the first hundred years construction is predominantly of new enterprises, premium housing, and worker housing. As the particular land area (a fixed area representing part of a large city) becomes full, new construction is reduced to the replacement of demolished structures. At the end of the growth phase, buildings are mostly new and are occupied by successful industry and economically self-sufficient population. But as they age, employment in the industrial buildings decreases while occupancy in the housing increases. The increased population density in housing occurs because the aging housing is acceptable only to lower-income families who must use the space more intensively than those who occupied it when the buildings were new. The declin-

ing area is then characterized by falling job opportunities and rising population. The living standards of the area fall as the per capita income declines. When the standard of living falls far enough, the depressed conditions limit further migration into the area even though there may be empty housing. A balance is established where available housing beckons the underemployed while lack of available work repels them.

Figure 5, showing additional variables over the same time interval as Figure 4, tells how internal conditions change as the area shifts from growth to stagnation. The underemployed/job ratio, a measure of unemployment, was low during the first 80 years of growth. But between 80 and 130 years this ratio rises suddenly as the underemployed population continues to rise while jobs decline. At the same time the underemployed/housing ratio, a measure of housing scarcity, falls. During growth, population balance was maintained by high job opportunity counteracted by a housing shortage. During stagnation, the roles reverse, with a job shortage and a housing excess. Few people think of the slum areas as having excess housing, but housing is excess compared to the available work and even excess compared to the population (given the housing density that their limited means forces them to tolerate). Empty buildings exist adjacent to over-crowded buildings. This is caused by a depressed economic condition, not a housing shortage. The income of the area is inadequate to maintain and use all the housing.

Low-Cost Housing?

Figure 6 shows how the computer model can be used to examine policy changes. The 50-year span starts with the conditions as at the end of Figure 4. A low-cost-housing program is started and sustained throughout the 50 years. It builds housing each year for about 2.5 per cent of the underemployed population. The amount of housing available to the underemployed rises, but most other conditions in the area are further depressed. The housing attracts more underemployed population until eco-

conomic conditions decline far enough to counteract this inflow. During the 50 years, new enterprise falls by 49 per cent and mature business 45 per cent. Premium housing declines by 34 per cent and worker housing 31 per cent, while housing for the underemployed rises 45 per cent. The managerial-professional and labor populations fall by over 30 per cent. The underemployed/job ratio rises 30 per cent—there is more unemployment than before.

Of the many policies examined that are commonly assumed to help an urban area, construction of low-cost housing appears the most detrimental. It draws people into a social trap from which there is little economic escape. As explained in *Urban Dynamics*, other common proposals for alleviating the condition of the cities—job training, government-created jobs, and national financial subsidy to the cities—all appear to lie between neutral and detrimental.

Revival from Within

Figure 7 suggests an approach for urban revival from within. Again, a new set of urban management policies operate for 50 years starting from the final stagnation conditions of Figure 4. Here a slum-demolition program removes 5 per cent per year of the most deteriorated category of housing. At the same time, incentives have been added and hindrances removed to favor a more rapid construction of new enterprise. In the 50 years, we see that new enterprise and mature business rise by over 60 per cent; professional and labor populations are up by over 50 per cent while the underemployed population has fallen 11 per cent.

Figure 8 accompanies Figure 7 and shows the compensating changes in housing and jobs. The underemployed/housing ratio has risen by 58 per cent, meaning that less housing is available. But the underemployed/job ratio has fallen by 41 per cent, to a point where people and jobs are about in balance. If the area is to revive economically, it is essential that the excess housing at the lowest level be removed. Otherwise anything that tends to improve living conditions will attract enough lowest-income people into the available housing to pull the standard of living back down far enough so that economic distress limits further inward migration.

Such a proposal for reducing the slum housing might seem anti-social, and detrimental to the interests of the underemployed population, if one did not look deeper into what the system is doing. Before the new policies for revival, the run-down housing attracted people into a situation that had little upward economic mobility so they become stranded in economic despair. By contrast, in Figures 7 and 8, additional information from the simulation model shows that after 50 years of the

new policies more underemployed are entering the area each year than before, fewer are leaving, and the upward economic mobility of the residents has risen by 67 per cent. The area has become a much more effective socio-economic converter for the poor, as well as having a higher internal standard of living.

The convergence of two areas of M.I.T. pioneering—feedback theory and computers—may produce far greater impact on society than more popularized developments like atomic energy and space flight. Economic crises, inflation, international conflict, failures in developing nations, price instability in world commodities, urban deterioration, student unrest, population pressures, and the stresses between the individual and the organization all reveal our failure to master the social dynamics of our environment.

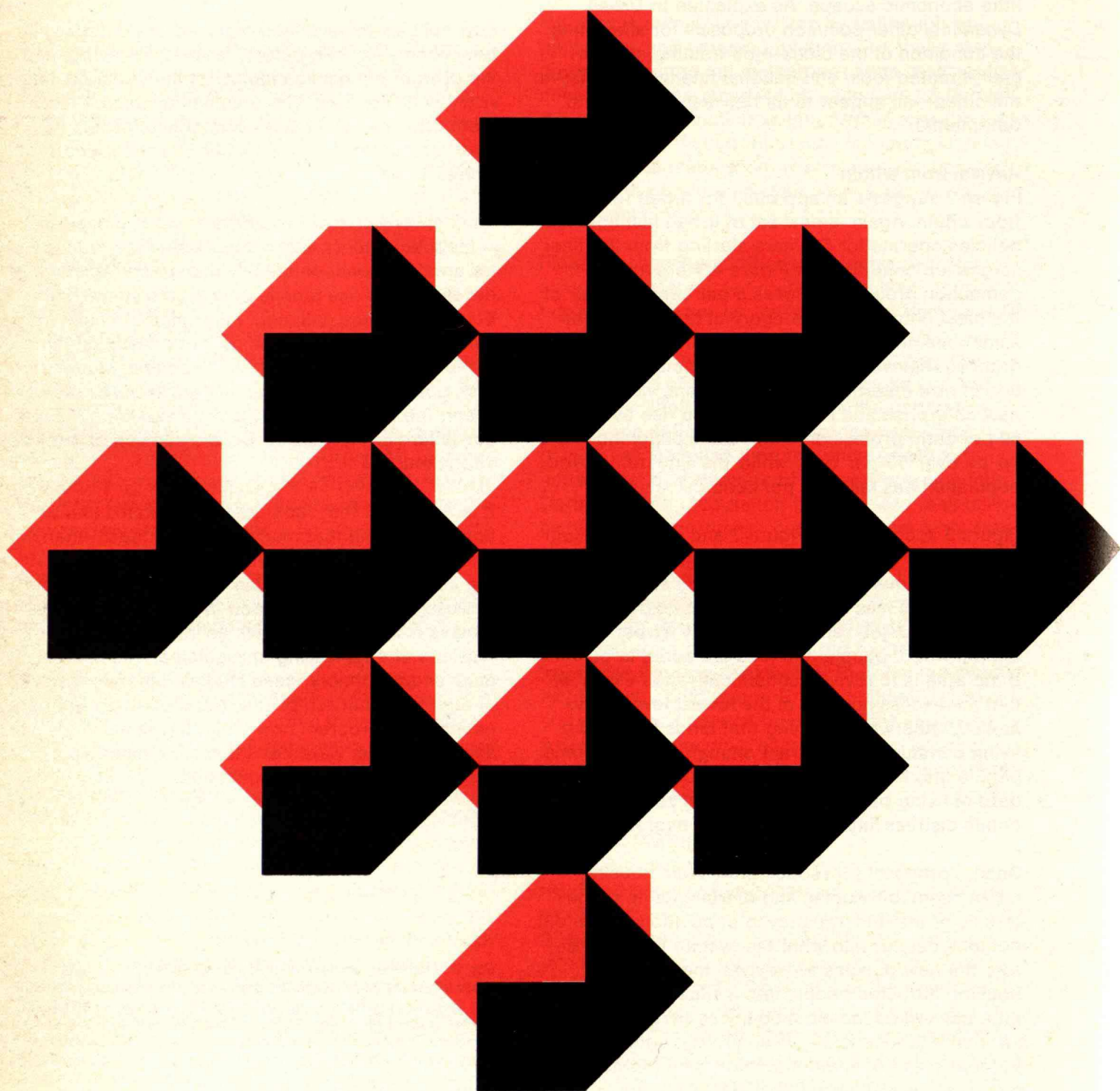
It is now clear that such complex systems can be understood and that much improved legal, financial and organizational structures can be devised. But the improved understanding will come slowly. The professional training needed to deal with such systems is at least as extensive as training for the professions of engineering or medicine. The student must acquire theory, case studies, laboratory work, and an apprenticeship. Only parts of an appropriate educational program now exist; the remainder must still be created. Here lies the most challenging frontier in research and education.

Jay W. Forrester, Professor of Management at M.I.T., was Director of the M.I.T. Digital Computer Laboratory and Head of the Lincoln Laboratory Digital Computer Division for ten years before joining the Sloan School of Management to work on computer applications to systems problems in industry and, more recently, social problems. The illustrations accompanying this article are drawn from Professor Forrester's book Urban Dynamics, to be published this month by The M.I.T. Press.

As data banks increase in size and power, they challenge our standards of privacy, due process, and public responsibility

Alan F. Westin
Professor of Public Law, Columbia University

Computers and the Protection of Privacy



To what extent is man to be remade by the machine? To what extent will we control our machines in general, and the computer in particular, so that we can maintain the human values of civility, liberty, and privacy? Or, facing the other side of the argument, to what extent shall we, either willingly or unwillingly, allow our machines to penetrate into the organization of society and its decision-making in ways that will be fundamentally destructive of our humanistic orientations?

This paper deals with but one aspect of these questions: the protection of privacy under the new conditions brought about by the computer and the communications systems associated with it.

Let me begin by stating what I take to be the role of privacy in a free society. For legal and political purposes, privacy is defined as the claim of individuals and groups—and to some extent organizations and institutions—to decide for themselves when they will communicate with others, to what extent they will share or withhold information. The essence of this concept in a free society is the power it grants to individuals and institutions to decide when sensitive information about themselves moves into the public sphere. The important thing to note is that when such information does enter the public domain it exerts a regulatory or constricting effect upon us through its effect upon our legal status, our prestige, or our social status—or upon the delicate balance of position and power through which we are each connected as actors in the social process.

It is clear that in the last 2000 years of Western political history, the issue of limits on the power of public and organizational authorities to keep individuals and small groups under surveillance has been one of the key elements in the struggle for civil liberty. And while clearly this is not the only way to measure a society, it is equally certain that a great deal can be inferred about virtually all the other balances between liberty and order in the system from an understanding of the social and

legal definitions governing the authorities' power of surveillance over the private lives and activities of citizens and social groups. In that sense, one of the hallmarks of the American political system from its earliest days has been the severe limitation upon the power of government to keep the citizen under tight surveillance. The Constitution places strict limits on search and seizure, on the production of private and government records and on psychological surveillance (through limiting inquiry into religious or political beliefs). The Fifth Amendment to the Constitution, assuring the privilege against self-incrimination, was one of the high points in the struggle of English and American constitutionalism to assure privacy for the interior processes of thought and belief.

Our dilemma today is that modern technology has broken down the physical preconditions on which each of these legal and social sanctions had rested. Walls and windows of homes and offices which once—with reasonable care—assured privacy for conversations and acts are now penetrable by microminiaturized listening devices, long-range watching devices, and cameras that can photograph in near-total darkness; our concept of trespass, search, and seizure has been eroded by technological breakthrough. In the area of psychological surveillance, polygraph devices and more recently hidden camera records of pupil dilations and blink rate, personality testing, and other psychometric measures represent means by which science is challenging the boundaries of psychological immunity. And in the area of documentary or record surveillance, the computer and the communication network together constitute a major pressure on the traditions and systems of privacy that developed to embody our constitutional balances.

I put the two—communication and computer—together for an important reason. The computer, with its capacity to store and process vast amounts of information, far exceeds the power of armies of information collectors and file clerks. But it is the

communication network that links computers to remote terminals for collecting or distributing information that makes possible the "real-time" far-flung information system, and it is this system which poses the serious problems of privacy in our society. For today we are developing information receivers throughout the country and in every area of our lives—in schools, universities, corporations, governments. These receivers are linked to the central information warehouses, where the information is collated and processed—and from whence it can go out again to the terminals of decision-making where evaluators determine whether we do or do not go to college, take a job, receive credit, are branded a security risk—whether, in short, we shall have access to the significant points of advancement in the society.

These issues rose to the surface dramatically in the congressional debate over the National Data Center in 1966 and 1967. It was proposed by the Bureau of the Budget and a group of private consultants to collect the statistical information scattered throughout 21 federal agencies in order to establish richer statistical bases on which to make judgments about social trends in the society. The difficulty, brought out very clearly in a series of congressional hearings, was that this information in the National Data Center would have to be linked to individual identities. This meant that the information in one file on John Smith could be mixed with that in another file on John Smith—his social security file with his income tax file, for example.

So it soon became clear that unless there were the right combination of safeguards in that system, what was built and designed precisely for a statistical system could in fact be converted into an intelligence system. It could, for instance, produce a dossier on John Smith which could be used to regulate him or prosecute him or administer him or influence him in various ways. The National Data Center was rejected precisely because its proponents could not persuade Congress and the public that they could install a blend of system, ad-

ministrative, and legal safeguards that would effectively limit the risk of misuse of this vast store of centralized information.

The rejection of the National Data Center was the occasion for a good many congratulatory editorials on one more triumph of individual liberty. These are highly premature. For today we have data banks springing up all over the landscape in both public and private sectors, and the problems suggested by the National Data Center are posed just as sharply and acutely as the most perceptive of the congressional debaters forecast. The issue, far from being still on the drawing boards, is upon us with such acuteness that our opportunities to provide answers may soon be limited by the way the systems are being built, the way they are being managed, and the legal frameworks which are surrounding them.

A Catalog of Data Banks

Let me describe very simply some of the computerized data banks that are building, and then turn to some of the issues and possible solutions which they raise.

The simplest kind of data bank now developing in government is that housed within a single agency. Such systems are typified by the integrated information system serving the California State Motor Vehicle Department, which contains all of the data about each individual license holder—his vehicle, his record of violations, and all the license information about him. This system is connected to the licensing agency, the courts, and the police. Through it circulates all the information about every California driver that has to do with his relationship to automobiles and highways.

Such a system has an obvious and interesting by-product for the agency which it serves. I have observed again and again that once an agency installs its lovely big computer, and has programmers to be put to use and machine-time to use, it tends to ask for much more information from the individual than

it sought before. So a major impact of the computer when a single agency creates a data bank is to draw from the client or customer much more potentially sensitive information than was collected before, because of the cost factors.

A second type of government data bank is one created for policy studies at a single level of government, of which the Detroit Social Data Bank is an example. This bank resulted from the City of Detroit's decision to bring together statistics on such social and physical indicators as truancy rates, venereal disease rates, and occupancy rates in buildings as a basis for measuring decay, the incidence of crime, and other urban problems. The purpose was to make more effective the proposals for federal grants so that the City of Detroit could obtain urban renewal funds. The Office of Economic Opportunity, rewarded in its demands for mountains of statistics in order to demonstrate the grantee's special needs, was in fact generous to the City of Detroit with federal urban renewal aid.

The New York State Identification and Intelligence System is a third type of governmental data bank—an information clearing house—in a particular field that serves many agencies in that field at many levels of government. In this case the central computer operation in Albany services 3600 criminal justice agencies in New York State—the police departments, district attorney's office, the courts, the sheriffs' offices, the prisons, and the probation and parole agencies—by collecting all of the arrest, trial, sentence, appeal, and detention records that each of these agencies used to keep separately. These collected data are then supplied on a need-to-know basis solely to the participating criminal justice agencies. As a state agency N.Y.S.I.I.S. has no powers of prosecution, trial, or investigation; it simply serves as an information clearing house.

Finally, there is in the public sector what I would call the general administrative data bank—the shimmering vision that dances in front of every mayor or county executive or governor—the idea

that somehow he could have on-line and in real time all the information about all the things that are going on in or affect his unit of government. One example is an interesting experiment being conducted in New Haven in co-operation with International Business Machines Corporation to create a total management information system linking all of the city agencies into an on-line system that reports rates and changes and policy effects. In addition to this, there would be consolidated files when available for each city resident: when the name of John Smith is fed into the system, the city official will be able at a glance to know all of the contacts that John Smith has had with every agency of New Haven—whether he is on welfare, the state of his tax bill, what licenses he has applied for—all of the things that represent his separate points of contact within the city, so that all of these can be reviewed whenever a decision is to be made about John Smith.

Data in the Private Sector

The same multiplicity of data banks with many of the same forms exists in the private sector. M.I.T. itself provides an example of a data bank being developed within a single institution, for I have recently been asked to meet with a group of administrators, faculty, and students considering the problems of privacy involved in putting student, faculty, and institutional records into the M.I.T. administrative computer system. With a great deal of foresight, the members of the committee were asking what protection should there be for students, faculty, and the university. It is a very real problem; for example, records of the political organizations to which students belong have been collected without real purpose, but these may be revealing records when legislative committees begin to ask questions 10 or 20 years later, and it is a vital question to ask whether such records should be kept at all.

There are also developing in the private sector a large number of statistical data banks, most of which are for social science research. These raise another issue which I think has not been well con-

sidered as yet in our society: as a result of the explosion of survey activities and data-processing techniques, we are building great numbers of data banks in fields such as urban research, political behavior, child development, creativity, and intelligence studies. Originally collected often with identifying names attached to them by a researcher or an organization for its purpose, these are now being increasingly put into centralized research data pools. The purpose is wholly statistical, and—assuming a high degree of fidelity and responsibility on the part of the data pool managers—there may seem to be no issues of privacy present. But there is no legal privilege for these data banks at the moment; they are not protected by any traditional lawyer-client or doctor-patient relationship; they are unprotected islands of very attractive data which can be reached by the courts, by investigating committees, and by others.

At a level comparable with the New York State Identification and Intelligence System, the private sector is now beginning computerization of vast bodies of information in the derogatory class. The obvious examples are the retail credit bureaus, whose information has long been collected but which is now being multiplied in terms of both quality and quantity. Out of these operations are developing national derogatory information networks with ever-larger data bank systems which combine retail credit service, insurance investigation, and employee investigation to provide a complete service for anyone who wants anything derogatory checked on anybody. This raises in the most significant, serious way the probability that information given for one purpose, such as credit, or for another purpose, such as insurance, or for a still separate purpose; such as in employment, is now being mixed together.

One last problem—the area of general administration in the private sector comparable to that in the public sector—now looms on the horizon. I refer to two things: the information handling utility, in which there may be stored in one computer information about a large number of companies or individuals, and the often-associated agency that offers management services in connection with this central utility. What is the responsibility of this central manager for the data that is put into his computer utility system? And what about the financial utility that many think is coming—the agency which will be part of the checkless, cashless society in which many transactions are performed by credit card or identification symbol out of a central account rather than by cash or check? There will be vast amounts of information about individuals' financial transactions in such financial utilities' files, and sensitive as this information is, the data banks have no legal protection in our society at the present time.

I hope that this very brief review of the present status of data banks suggests the nature of this problem: we are building hundreds of data banks with communication networks uniting them; they are outgrowths of the way in which we have always kept records, files, dossiers, and information; but in terms of the quantity of the information, its sensitivity, and the speed with which it circulates through the evaluative system of the society today, these systems present a problem of new dimensions.

Three Kinds of Responses to Computers

I suggest to you that this is not a problem beyond human control. We must be ready with responses in three areas: privacy, due process, and public review and audit. Formulating these responses will require a great deal of work, and I can only touch the highlights here.

One key issue of privacy is whether information of certain kinds should be collected at all in these systems; are there some kinds of information that should be excluded simply because it is too sensitive or too dangerous to have in large data banks no matter what safeguards are included? Another issue of privacy is to what extent one piece of information within a data bank ought to be associated with another, because it is often possible to create a new level of sensitivity by associating two seemingly unrelated pieces of information together. And a final issue in the area of privacy: What information should be disclosed and circulated and to whom? Who has a right and a need to know the information that comes out of a data bank, and to what extent has the individual who provided the information consented to its further use?

Shifting to the problem of due process, there are again three questions that must be asked: first, how can you give an individual the opportunity to know what is in his file? This privilege is in certain ways the most important and most powerful safeguard that can be given. Students in the social sciences know that the minute an information-collector becomes aware that the individual about whom he is collecting information will be able to see what is written, that investigator becomes more responsible, careful, and corrective in the way he collects and records data. The privilege of inspecting files is not now commonplace; you cannot go into a retail credit bureau and see your own file. Only a substantial legal pressure on credit bureaus, which has begun, will make them accept the fact that the individual should be able to know what is in his credit file in order to protect himself against inaccuracy and abuse.

Once an individual has seen his file, he must have some opportunity to challenge its accuracy; and he

must have some meaningful procedure by which that accuracy can be tested.

Finally, in the area of due process, we must anticipate the possibility that, even if the facts be accurate, the individual may wish to contest interpretations based on the facts. To meet this need, we should develop a way of letting an individual put into the data bank his own evaluation or interpretation of a fact or event, so that those who study the record will automatically see the individual's version of a story or a problem—not just that of the informant or the evaluator. This can be done much more easily in a computer than in a manual system, for you need only program the computer so that every time it prints out the evaluation it also prints out a 25-word explanation by the individual.

Finally, there is the question of public audit and review. In the American political system the separation of powers provides a major aspect of the civil liberties protection which makes the citizen secure. We need the same philosophy in the control of public and private data banks; we need to develop outside instruments for review and audit. These can take the form of watchdog or ombudsman-type agencies; there can be legislative agencies with annual inquiries over executive agencies; there can be public review boards; there can be industry-wide committees—any number of forms are available. The essence of this approach is that any individual who feels that the information about him is improper or wrong or that he has been mistreated should have some right of contest, some opportunity to challenge the record before it is frozen into the print-outs of a computer information society.

Dangers and Safeguards

Should one be very pessimistic or can one have some sense of optimism about computers and their effect on privacy? I am not sufficiently gifted in prophesy to answer with assuredness. But there are principles that seem to me important: first of all, there are greater risks to privacy when information is centralized and consolidated. But do not be so

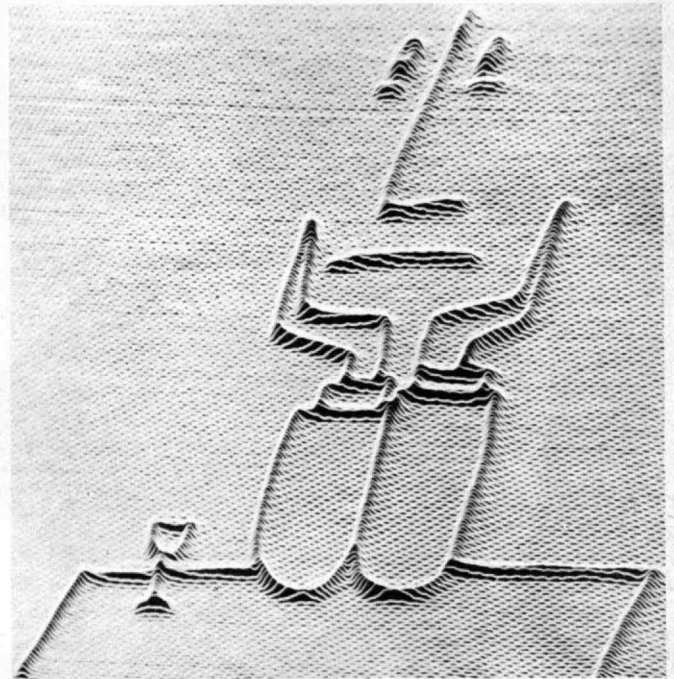
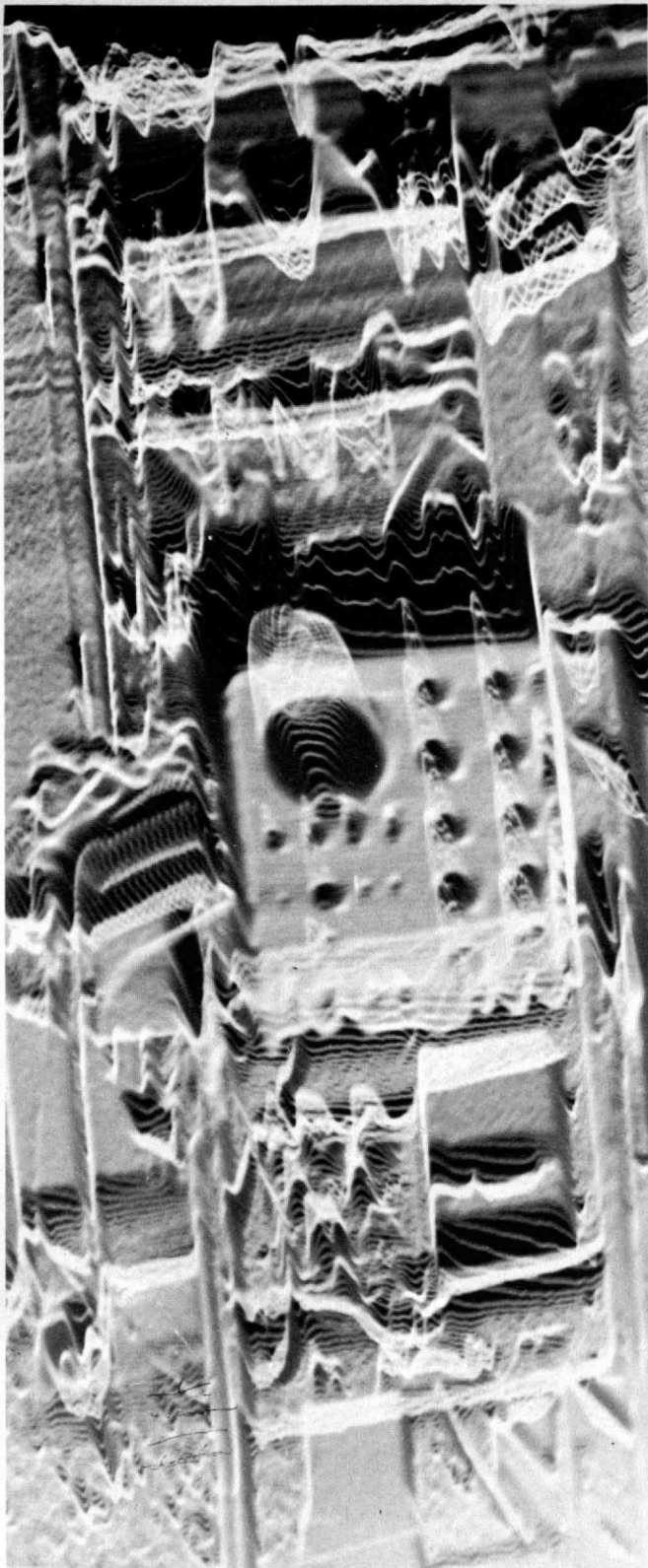
sure that we should return to the supposedly secure information system of the days of manual files; remember how effective a box of candy or a bouquet of flowers or a good telephone call could be in getting very sensitive information from files and drawers. Clearly information was very vulnerable in the days of manual files.

By centralizing information we may make it more complete, tempting, and powerful. But we may also improve on rather than limit the sense of privacy which individuals can have in our society. First, public concern over the issue is forcing public and private organizations to become more self-conscious about the role of privacy and the role of information in society; and this exercise could—if properly nurtured and protected—lead us to give far more protection for individual rights than we provided in the pre-computer era. Second, the computer itself, ironically, offers a great deal more opportunity to protect information at a systems level if you mean to do it; access can be so guarded that the machine is almost inaccessible to unauthorized persons, and guarded public audit systems can provide restraints on how even those with access to the system make use of it.

Here is the dilemma. The computer is threatening our levels of privacy as never before, but it also offers more protection for privacy than we have had heretofore. As always, the machines are neutral. The answer depends on what man will do with them.

Alan F. Westin is Professor of Public Law at Columbia University and Director of the Center for Research and Education in American Liberties in Teachers College. This article is based upon a transcript, edited by the author, of Professor Westin's address to the 1968 M.I.T. Alumni Seminar.



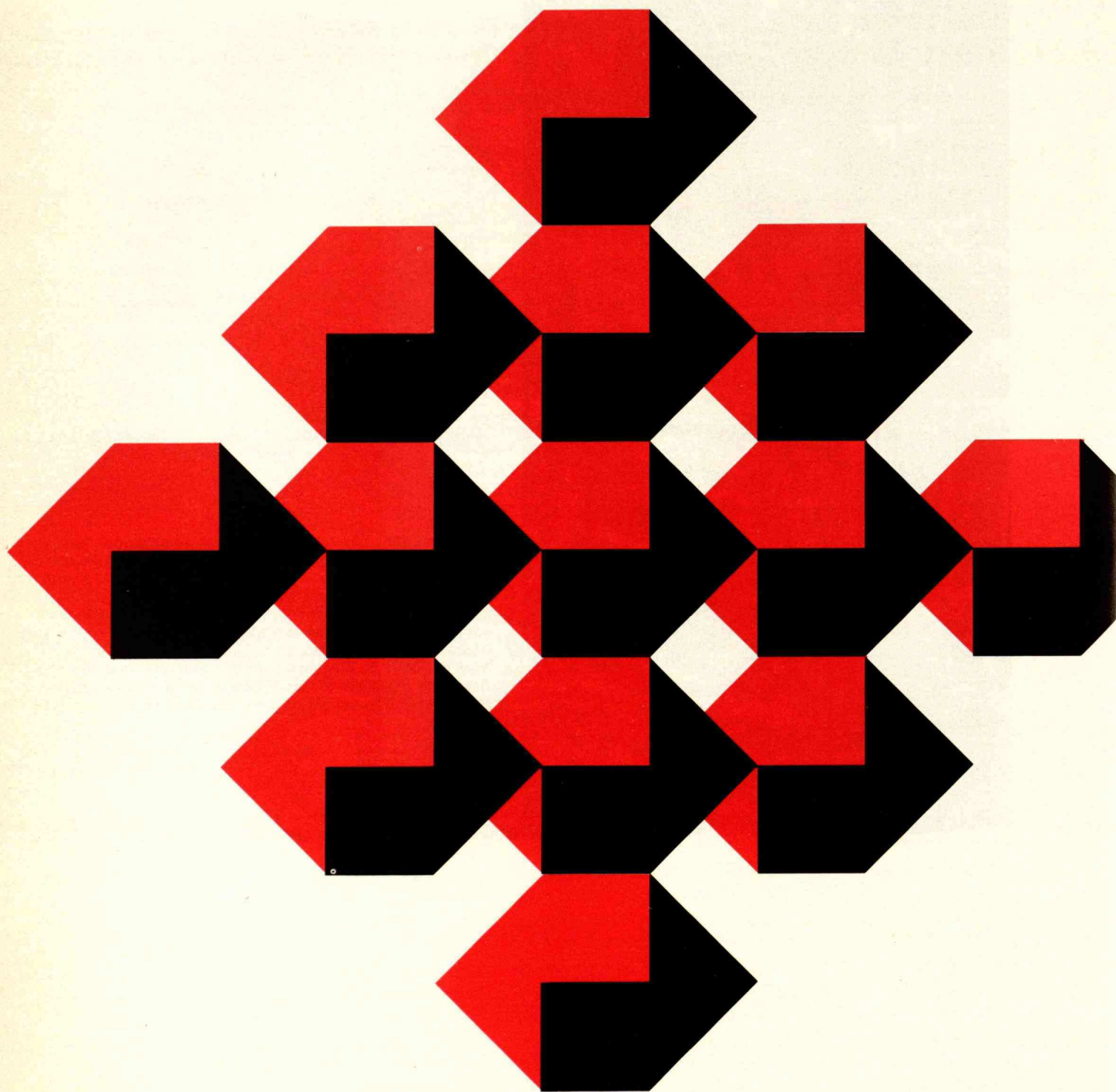


The computer's power to process data yields unique visual as well as statistical images, and M.I.T. students have frequently capitalized upon these in their work for the Institute's visual arts courses. The picture immediately left is a self-portrait of the oscilloscope from which the computer output is actually photographed; the other two are three-dimensional impressions of drawings by the noted artist Saul Steinberg. All three are the work of Efraim R. Arazi, who studied with Robert O. Preusser, Associate Professor of Visual Design, while an undergraduate in the M.I.T. Department of Electrical Engineering from 1961 to 1965.

The computer has invaded the world of banking so quietly that few of its customers sense its present—or its future—central role in keeping multiplying transactions under control

George H. Ellis
President, Keystone Custodian Funds, Inc.

Computer-Based Services in Personal Transactions



People everywhere have fallen in love with a vision of what computers may do for them. Many businessmen have become "half crazy" about what computers have done to them. The example of computer-based services which I choose to discuss—the payments system now in use and as we can foresee it in the U.S.—is simply one of many causes for our universal faith in this particular fruit of modern technology.

I propose three assertions: computers have brought us to our present sophistication in the evolution of our payments mechanism; computers provide the most important resource for further improvement of the payment system; and the major outlines of the future payments mechanism are already evident.

Computers in Today's Monetary System

Without pausing to explain in detail the complexities of today's monetary system, I want to start with the statement that computers make possible the kind of monetary system that most of us take for granted today. There are approximately \$38 billion in currency and coin in circulation, and perhaps 40 per cent of the American people deal almost exclusively with cash. But there are \$140 billion in demand deposits in the nation's commercial banks, and approximately 90 per cent of the total dollar value of payments are made by check.

There are perhaps 67 million checking accounts in the country's 14,000 commercial banks, and each year about 17 billion checks worth an estimated \$3 or \$4 trillion are written. Each check travels from payor to creditor and then to his bank for collection. That bank often sends it through the Federal Reserve banks to the debtor's bank where it finally appears in his monthly statement of account. At each point in the cycle that check must be sorted, tabulated, bundled, and forwarded to the next succeeding step, and this is where the computer, operating on the Magnetic Ink Character Recognition Program (Mica) begun 13 years ago, now has its crucial role.

Mica is simply a method of putting the critical financial information in a form that can be read by the computer. Properly instructed, the computer can digest the bank identification number, the dollar amount involved and the account to be charged. Using this information, the computer then sorts the checks at rates in excess of 1500 checks per minute. Only by rapid introduction of those computer controlled sorting devices have the nation's commercial banks been able to keep step with the growing financial needs of our economy.

How a Computer Looks at Money

However important computers have been in creat-

ing the present monetary system, perhaps their greatest contribution arises from the way computers look at money.

To a computer a check is merely an instruction to debit one deposit account and credit another. If deposit account records are stored in computer memory, the necessary action is simplicity itself. If the accounts are in different banks, the same result can be instantaneously achieved by linking the two computers together and passing the essential minimum information over communication wires.

The challenge thrown down by the computer for the future is to transmit information—but without the paper. This challenge leads inevitably to speculation about a "checkless society," a phrase that has captured the imagination of journalists to the point of popularizing a concept long before economic, social, and legal aspects of the electronic communications possibilities have been resolved.

Will we have a system that moves money as information? Thomas J. Watson, Jr., of International Business Machines Corporation has written, "In banking alone, for example, the advances of yesterday are merely a faint prologue to the marvels of tomorrow. In our lifetimes we may see electronic transactions virtually eliminate the need for cash. Giant computers in banks, with massive memories, will contain individual customer accounts. To draw down or add to his balance, the customer in a store, office, or filling station will do two things: insert an identification into the terminal located there, and punch out the transaction figures on the terminal's keyboard. Instantaneously, the amount he punches out will move out of his account and enter another.

"Consider this same process repeated thousands, hundreds of thousands, millions of times each day—billions upon billions of dollars changing hands without the use of one pen, one piece of paper, one check, or one green dollar bill. Finally, consider the extension of such a network of terminals and memories across city and state lines, spanning our whole country."

Mr. Watson's vision is shared by many. I am not a technician, but I am advised that such a Direct Funds Transfer System is technically feasible today. The development of an electronic payments system is *not* limited by technology or by conceptual framework. What is required is social engineering of three varieties—economic, legal, and human.

Let me illustrate by a sampling of questions. In the economic sphere one asks, Who is to make the substantial investments that are obviously required? What are the projected revenues to support such

investments? Who is to control the payments centers? Banks? Computer service companies? Telephone companies? The Federal Reserve? The Post Office, as in some foreign countries? And who is to decide?

Continuing, How do we assume compatibility of equipment and procedures necessary for a nationwide system? What is the legal status of a payment made by electronic transfer? How does one prove in court—or to an internal revenue agent—that payment was made, or not made? How is the system made foolproof? Finally, how much are you willing to pay for electronic money? Do you want to pay immediately for your purchases? Or do you wish to “charge it” for later payment or non-payment if you return the merchandise for any reason?

Please understand me. These questions are not presented with a sense that they are not answerable. They are presented to illustrate the economic, legal, and social engineering that must be accomplished before an electronic payments mechanism becomes a major institution.

The Major Features Are Already Present

My own convictions about the future payment mechanism emerge from the fact that we have for years been running parallel systems of cash, checks, and credit extensions (using techniques such as credit cards) for use in settling obligations. The most likely path for the future will be continuation and gradual blending of these three systems as the electronic network emerges. Accordingly, I am prepared to make five declarative statements that will stand as my speculations about the future payment mechanism:

Currency and coin will remain in active use in our economy for many years to come.

The convenience and economy of using coin and currency will insure its wide acceptability for many more years. It is difficult to visualize use of anything but coins to buy a newspaper or operate a parking meter. In fact, some improvements in our currency mechanism should actually increase the use of coin and currency.

The Bureau of Engraving has underway a study of how to improve our currency so as to make counterfeiting more difficult. Given the development of a currency containing some unique characteristic that enables machine detection of counterfeits, we should expect to see development and widespread use of change-making machines for large denomination bills.

Use of currency will also be facilitated by techniques to obtain cash on short notice in non-busi-

ness hours. Several banks have installed machines that dispense pre-determined amounts of bills when a customer inserts an encoded card designed to activate the mechanism and record the customer's indebtedness. In addition, as credit cards become more widely used and accepted, they will be honored to obtain cash at more and more retail locations. I conclude, therefore, that the computer will in some ways facilitate the use of both cash and currency in our future economy.

Today's check collection system will continue to grow and will be a major part of our payments mechanism for many years to come.

Many millions of persons in our economy do not yet have checking accounts. With growing incomes they become more eligible for the advantages of this method of payment. In addition, banks have continuing active programs of promoting their checking services, both for the benefit of these services and also to associate customers with the whole range of available related financial services. Banks may be expected to continue to promote checking accounts as the unique advantage of a commercial bank relationship.

Checks have been widely adopted by the American public as an economical and convenient way to control payments from their deposit accounts. Checks have an established record as acceptable evidence of proof of payment and are preferred for legal transactions. Finally, the mechanisms for handling and processing checks, in both legal and mechanical frameworks, represent many years of investment, and banks will not move rapidly to dismantle the structure they have built.

As supplements to the check function, banks will continue to stress development of pre-authorized payment techniques. Employers will be persuaded to make payroll payments directly to customers' accounts in banks of the customers' choice. Customers will be persuaded to authorize insurance drafts, utility payments, and other forms of periodic, roughly predictable charges against their accounts, and they may also be increasingly persuaded to accept monthly deductions from their deposit accounts for investment and savings purposes.

These plans are in operation today at individual banks around the country; their extension is premised upon the computer's capacity to process such functions with great dependability and economy.

The Federal Reserve wire transfer system will provide a major expansion of capacity to the check collection mechanism and should serve as the unifying network for a nationwide electronic payments system.

Not many people are aware that the Federal Reserve System is already in the business of paperless fund transfers over a communications network which links the 12 Reserve banks and their 24 branches. Last year this network carried more than five million transfers totaling \$5.5 trillion, more than two and half times the value of checks processed through the Federal Reserve.

The Federal Reserve is presently installing a new nationwide wire transfer communication system which it hopes to have in operation early in 1970. The major new capability of this system will be the automation of data transmission between banking centers in a way that will either minimize or eliminate the need for converting information from one form to another and back again before the transmission is complete. Data accepted by the automatic equipment will flow immediately to compatible automatic equipment at any receiving office across the country.

Quite obviously, the expanding capabilities of a Federal Reserve communication system will permit an increasing volume of larger payment transfers to move over that system without the use of written payment orders. While this is expected to have only a limited effect on the number of payments made by check, it should help to reduce the dollar volume of checks passing through the pipeline.

Once developed, the Federal Reserve's wire transfer system should serve as the central skeleton upon which to erect a nationwide payments mechanism which will provide opportunities to carry the automated connections through to individual payment centers serving retail outlets. Developments in that direction, however, depend upon securing valid answers to questions such as I have proposed above.

Banks will move toward greater integration of their transactions and credit extending activities.

Greater computer sophistication, longer experience with computer programs, and a drive toward closer customer relationships will all intensify the banks' movement toward integrated accounting and servicing of each customer's checking account, savings account, investment account, and various loan accounts ranging from revolving credit accounts to automobile loans and mortgage loans.

There will be a consolidation of credit card systems.

Credit cards are here to stay. They have been accepted by consumers and they form an integral part of the transactions process at the retail counters. The competitive drive to provide bank

credit cards with national scope is already leading to consolidation of regional plans. Eventually we may expect just a few nationwide systems. The competitive struggle between the bank card systems, the retailer systems (such as gasoline cards), and the travel and entertainment card systems may not be resolved until a nationwide compatible payments mechanism as envisaged by Mr. Watson comes close to reality. At that point the unique position of the banks as holders of customers' deposit accounts may prove critical. Every retailer large enough to have an electronic payments terminal at his store will wish to have his customers utilize a single identification card providing access to that terminal. At this point, credit cards must change to become identification cards providing access to deposit accounts in which transactions and credit arrangements are integrated as noted above.

The Future Is Already Here

Even a brief reflection on the five speculations I have presented suggests that, while the computer will carry substantially enlarged responsibilities in the expansion and modernization of the financial mechanism that lies ahead, the effect upon consumers may very well be quite marginal. In many ways, the future is already here.

While he may expect to carry fewer cards, the customer of the future will still pass a plastic identification card to the gasoline attendant, the retail clerk, or the waitress to complete his retail transaction. For the sake of convenience he may pre-authorize the monthly deductions of his electric light bill from his bank balance just as he now authorizes a withholding of his federal income tax from his monthly pay check. Yet he is likely to continue receiving a monthly statement of his account and he will wish to retain the decision to pay or postpone certain payments of non-routine items.

For the financial institutions involved in transactions with this customer, there may be a substantial revolution in the technique of serving his needs. Banks may be marketing a broader range of services.

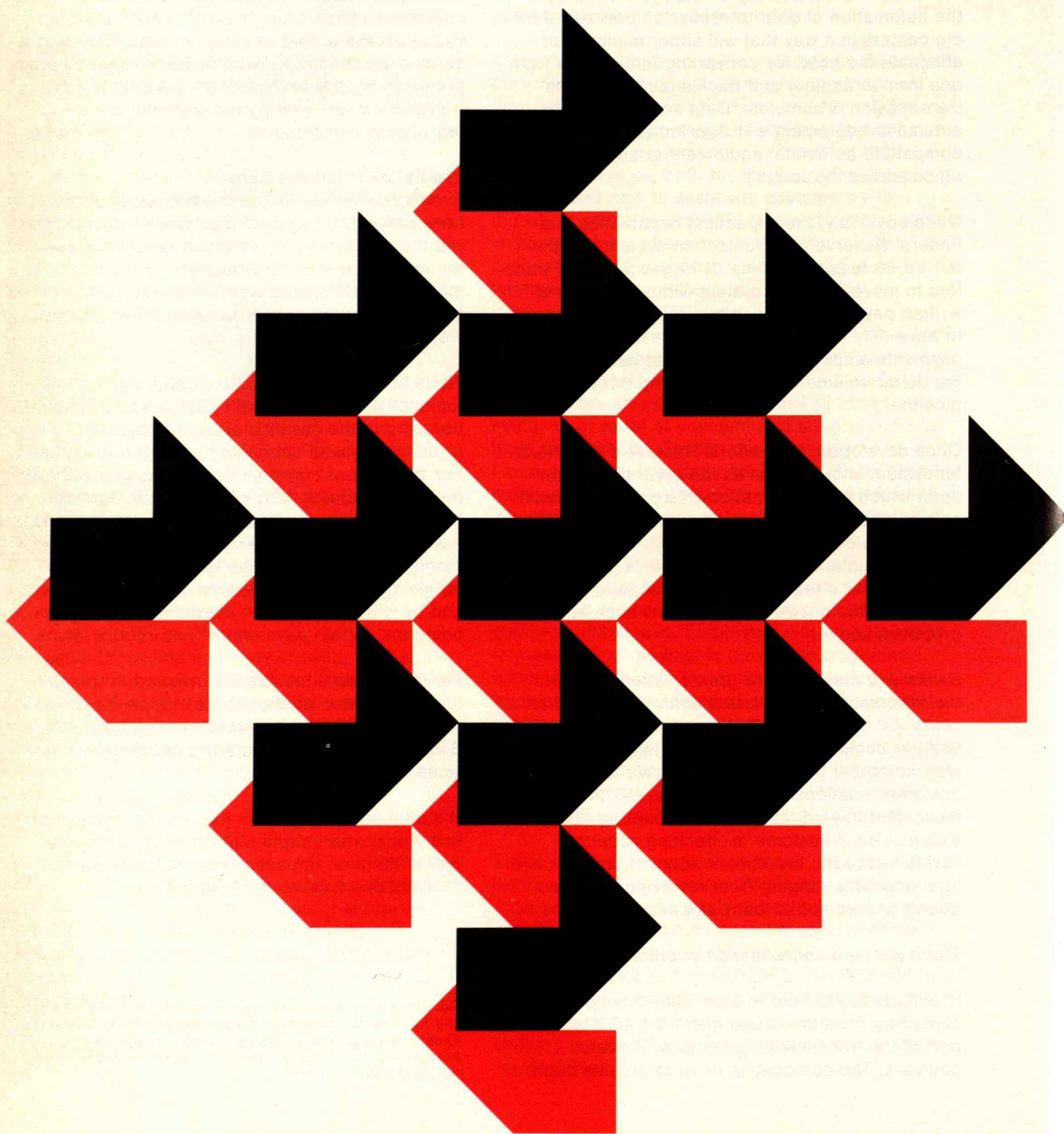
But all these changes are likely to be gradual, and in a world where rapid change is the accepted way of life their impact on the customer may be so slight that it escapes his notice.

George H. Ellis studied economics at the University of Maine and Harvard and taught at both institutions before joining the Federal Reserve Bank of Boston in 1951; he became its President in 1961, and he joined Keystone Custodian Funds, Inc., as President in 1968.

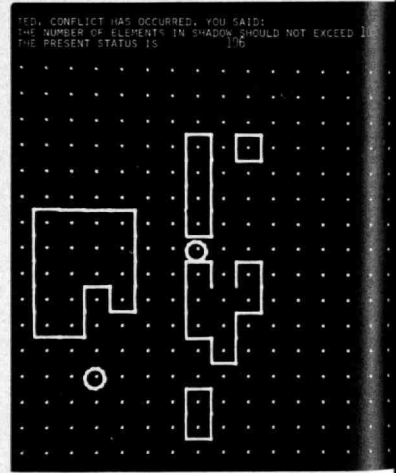
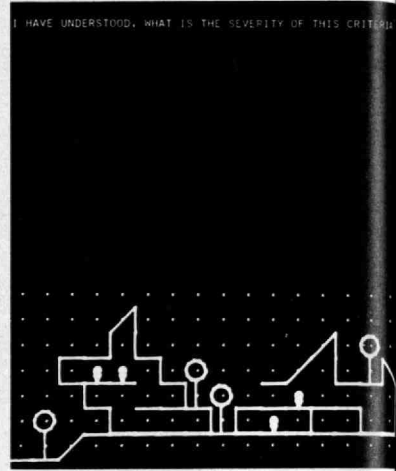
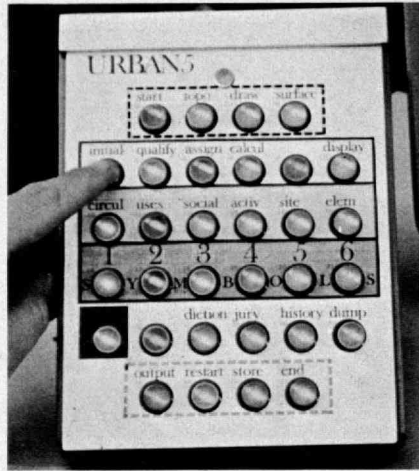
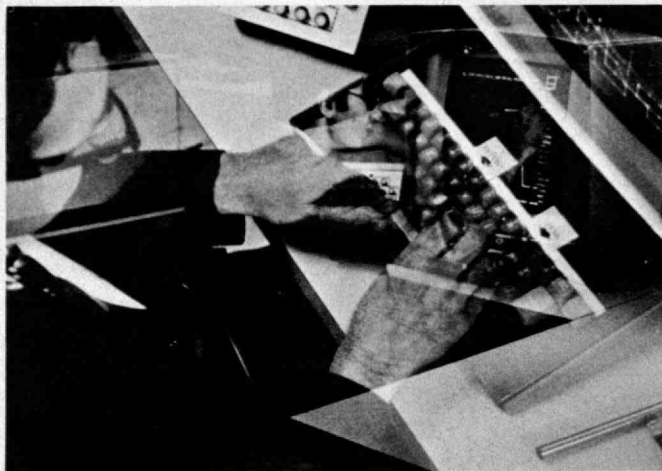
The transition from a "computerized" environment to a "computer-aided" environment will enable designers to have a dialogue with their new design partners—for example, the architect with his Architecture Machine

Nicholas Negroponte
Assistant Professor of Architecture
M.I.T.

Towards a Humanism Through Machines



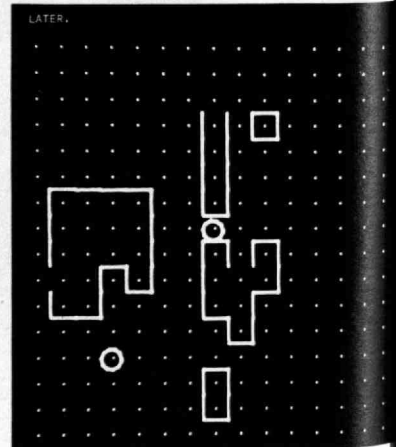
Towards a Humanism Through Machines



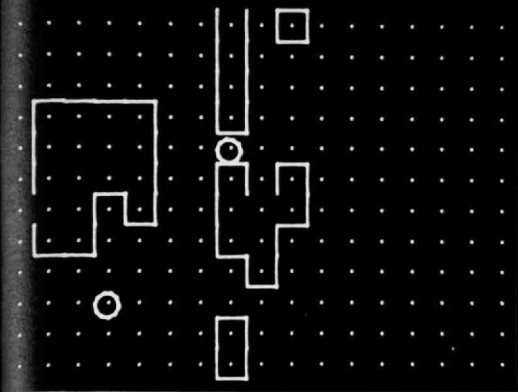
THE NUMBER OF ELEMENTS !_

ENTS IN SHADOW SHOULD NOT _

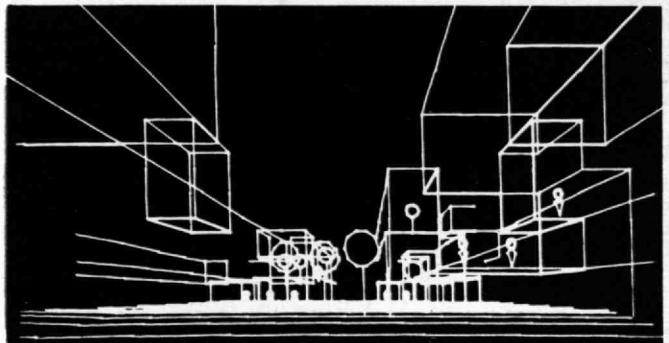
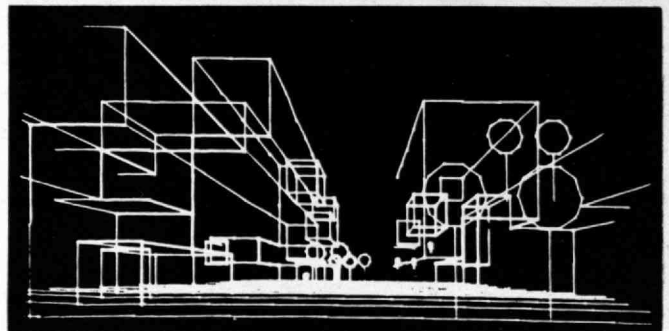
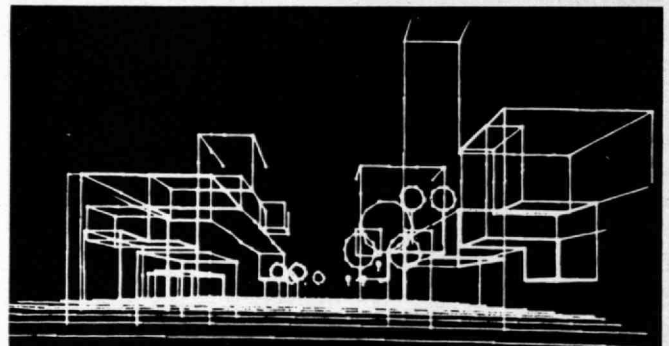
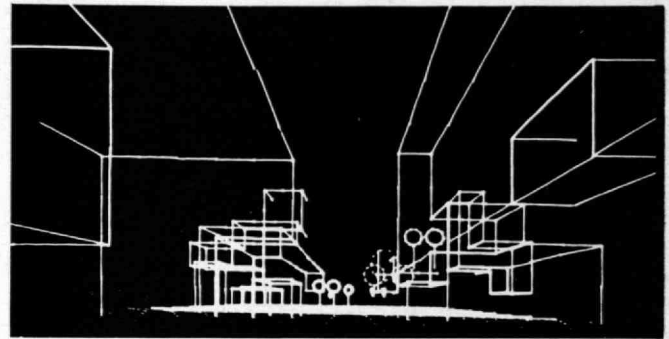
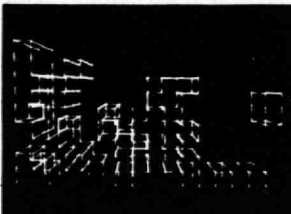
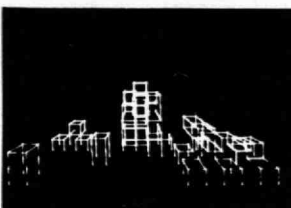
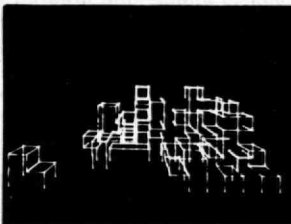
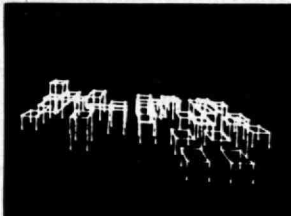
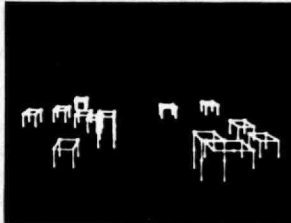
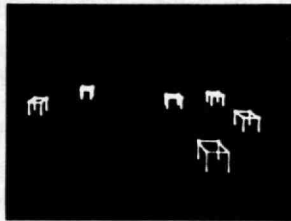
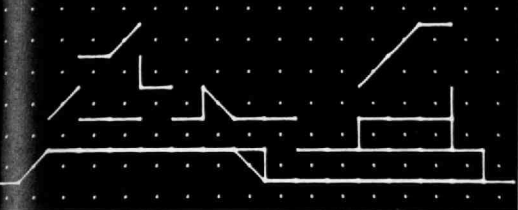
SHADOW SHOULD NOT EXCEED 10_



ED, BY HOW MANY MINUTES DO YOU WISH POSTPONE THIS CONFLICT?
POSTPONE IT FOR _

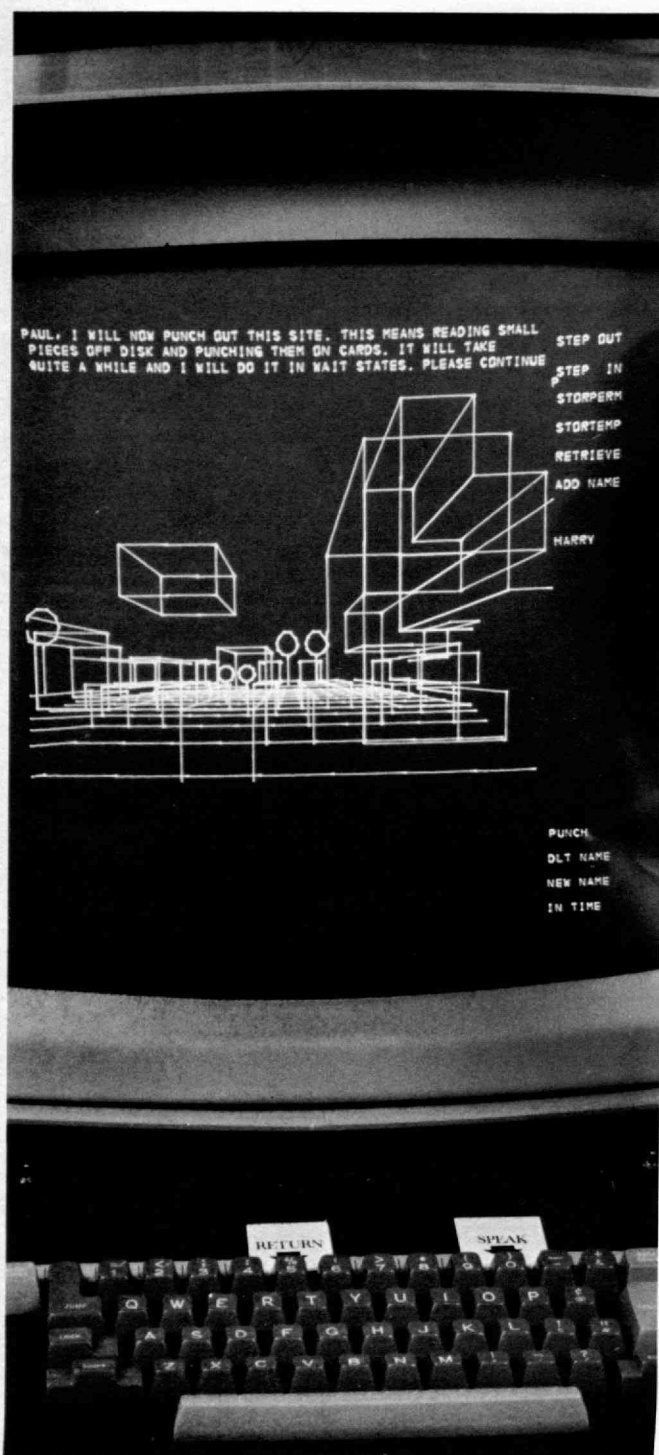


ED, CONFLICT HAS OCCURRED, YOU SAID:
THE NUMBER OF ELEMENTS IN SHADOW SHOULD BE 10
THE PRESENT STATUS IS 577



ED, MANY CONFLICTS ARE OCCURRING

ED YOU HAVE RUN FOR 45
MINUTES AND HAVE MADE 430
DECISIONS SINCE THE START



The illustrations on the preceding pages show a man-machine dialogue conducted under a computer program called URBAN5. Even though the program only crudely animates an architect-machine dialogue, the pictures illustrate the principles of a design environment of mutual reinforcement and interruption by both man and machine. It is important to note that the illustrations suggest a true dialogue with an evolutionary and intelligent system; but, in itself, URBAN5 is neither of these.

Page 45: The architect interrogates URBAN5 for a list of qualities implicitly attributed to elements. The system has a built-in (and changeable) repertoire of attributes it can handle geometrically.

Page 46, column 1: URBAN5 is a self-teaching system. The user is assumed to be unfamiliar with computers, with programming, and with URBAN5 itself. In as friendly a manner as possible, the system asks questions and presents instructions so as to gradually bring the user more deeply into the system over a period of time and growing acquaintance.

Pages 46 and 47, columns 2, 3, and 1: The designer has available two languages for communicating with the computer—English (from the typewriter) and graphics (through a light-pen on the oscilloscope). The machine looks for consistency between what is said in words and what is done graphically—i.e., criteria and form. This work occurs in the background. As the sequence shows, the designer pushes first the initialize button and then the speak button, and then he types a simple statement of intent—the criteria. The machine replies that it has understood, and the dialogue proceeds. Minutes, hours or days later the machine may report that a conflict has occurred. The architect (in the illustrated case) postpones the issue, but later the inconsistency is again posted. Many conflicts occur; the machine becomes bored; Ted is tired; and finally the sitting is terminated.

Page 47, column 2: Within an unconstrained situation, the machine operating under URBAN5 generates a growth form. The architect can interrogate URBAN5 as to what aspects of the criteria forced the form to take on certain characteristics.

Page 47, column 3: The crude jungle of lines are in fact perspective images displayed at the rate of one per second, either automatically or under the user's control.

Left: URBAN5 has within it the possibility of putting menial tasks into the background to be processed when convenient, allowing the foreground to be devoted by the designer and machine to his current, interesting problems.

Given that the physical environment is not in perfect harmony with Everyman's life style; given that architecture is not the faultless response to human needs; given that the architect is not the consummate manager of form and use; let us consider the evolution of physical environments. In particular let us consider an evolution aided by the use of a specific class of machines, as Warren McCulloch calls them, ethical robots. In the context of architecture, we shall call them Architecture Machines.

There are three possible ways of having machines assist the design process:

1. current procedures can be automated, thus speeding up and reducing the cost of existing practices;
2. existing methods can be altered to fit within the specifications and constitution of a machine, where only those issues are considered that are supposedly machine-compatible;
3. the process, considered as being evolutionary, can be introduced to a mechanism (also considered as evolutionary), and a mutual training, resilience, and growth can be developed.

We shall consider only the third alternative and shall treat the problem as the intimate association of two dissimilar species—man and machine—and two dissimilar processes—design and computation. We shall further define our concern as the acquaintanceship of two intelligent systems, the architect and the Architecture Machine. By virtue of ascribing intelligence to an artifact or the artificial, the partnership is not one of master (smart, leader) and slave (dumb, follower), but rather of two associates which each have the potential for self-improvement.

Imagine a machine which could respond to local situations in the physical environment (a family that moves, a residence that is expanded, income that decreases). Such a device could report on and concern itself specifically with the unique and the exceptional. In effect, it would concentrate

on the particulars. The human designer cannot do this. He cannot accommodate the particular; he obliges the general. Britton Harris suggests, "He is forced to proceed in this way because the effectuation of planning requires rules of general applicability and because watching each sparrow is too troublesome for any but God." The reader surely needs little reminder of the results.

Prelude to an Architect-Machine Dialogue

Consider that you are in a foreign country, do not know the language, and are in desperate need of help. At first your hand movements and facial expressions carry most of your meaning to the silent observer. Your behavior uses a language of gestures and strange (to the observer) utterances to communicate your purpose. The puzzled listener searches for bits of content he can understand and link to his own language. You react to his reactions and a language of pantomime begins to unfold. This new language has evolved from the mutual effort to communicate. Returning to the same person a second time, with a new need, you will find that the roots of a dialogue already exist. But this second conversation might be gibberish to a third party observing the exchange for the first time.

A designer-to-machine introduction should be a similar linguistic evolution. Each should track the other's design maneuvers, evoking a rhetoric that cannot be anticipated. The event is circular since the designer-machine unity provokes a dialogue and the dialogue promotes a stronger unity. This progressively intimate association of two dissimilar species is the symbiosis. It evolves through mutual training—in this case, through the dialogue.

A man-machine dialogue has no history. The historical and presently antagonized mismatch (non-dialogue) between man and machine has generated a great deal of preoccupation for it. In less than a decade, the term "man-machine communication" has passed from concept to cliché to platitude.

The theory, however, is important and straightforward: in order to have a cooperative interaction between a designer of a certain expertise and a machine of some scholarship, the two must be congenial. They must, for example, share the labor of establishing a common language. Thus a designer, when addressing a machine, must not be forced to resort to machine-oriented codes. And in spite of computational efficiency, the paradigm for fruitful conversations must be machines that can speak and respond to natural language.

With direct, fluid, and natural man-machine discourse, two former barriers between architects and computing machines could be removed. First, the designers using computer-aided design hardware would not have to be specialists. With natural communication, the "this is what I want to do" and "can you do it" gap can be bridged. The design task would no longer be described to a *knobs and dials* person to be executed in his secret vernacular. Instead, the job would be formulated and executed in the designer's own idiom, with simple negotiations. A vibrant stream of ideas could be directly channeled from the designer to the machine (and back).

The second obstruction overcome by such close communion would be the potential of re-evaluating the procedures themselves. In a direct exchange, the designer could exercise his proverbial capriciousness. At first, a designer might have only a meager understanding of his specific problem and thus require machine tolerance and compatibility in his search for the consistency among criteria and form and method, between intent and purpose. The progression from visceral to intellectual could be articulated in provisional statements that converge on both design and methods.

But the tête-a-tête must be more direct and fluid; it is gestures, smiles, and frowns which turn a conversation into a dialogue. In an intimate human-to-human dialogue, hand-waving often carries as much meaning as text. The "manner" carries

cultural information: the Arabs use their noses, the Japanese nod their heads. Customarily, in machine communication studies, such "manners" are ignored and frequently are referred to as "noise." But such silent languages are not noise; Warren Brody and Nilo Lindgren submit that a dialogue is composed of "whole body involvement—with hands, eyes, mouth, facial expressions—using many channels simultaneously, but rhythmized into a harmoniously simple exchange."

Imagine a machine that could follow your design methodology and at the same time discern and assimilate your conversational idiosyncrasies. This same machine, after observing your behavior, could build a predictive model of your conversational performance. Such a machine could then reinforce the dialogue by using the predictive model to respond to you in a manner that is in rhythm with your personal behavior. This dialogue would be so intimate (even exclusive) that only mutual persuasion and compromise would bring about perceptions and ideas—ideas, in fact, unrealizable by either converser alone. In such a symbiosis, it would not be solely the designer who would decide when the machine is relevant.

The overlaying of a specific design character upon a generalized machine is not fanciful; computer programs exist that illustrate some primitive attempts. An anonymous machine, after identifying a speaker, can transform itself into an exclusive apparatus that reflects previous encounters with that speaker. The extent of the metamorphosis depends on the length of acquaintance. At the onset of the partnership, the machine gathers gross features; later it avails itself of subtleties.

It might be argued that we are proposing the creation of a design machine that is an extension of and in the image of a designer who, as he stands, has already enough error and fault. However, we have indicated that the maturation would be a reciprocal ripening of ideas and ways. At first, jobs in which the man is particularly inept would stimulate

a nontrivial need for cooperation. Subsequently, each interlocutor would opt out of situations notably clumsy for his constitution, while at the same time he would pry into issues which were originally outside his scope of concern (or the concern of his profession). Eventually, a separation of the parts could not occur; the entire 'symbiotic' system would be, as Gordon Pask described, "an artificial intelligence that cannot be partitioned." It would be computer-aided design.

Computer-Aided versus Computerized

"Computerized" operations are too often misnamed "computer-aided." The computerized/computer-aided distinction is too often confused with or solely embodied in the mode of machine usage.

The conventional mode of computer usage for the past 20 years, "batch processing," entails a computation center to which a user delivers a "program" (a deck of cards, magnetic tape, paper tape) to be "run." Then several hours or days later the user returns to receive his "output." More recently, real-time computation depending upon "time-sharing" techniques allows the user a prompt machine response and permits terminals (usually teletypes) to reside in the office or at home. These terminals are connected to the large central machine, and they can be interconnected with each other. The rapid switching of users' programs in and out of the large machine provides each user with the illusion of a dedicated machine and permits him continual use of his terminal.

It is commonly suggested that the on-line nature of the interaction in a time-sharing system is in itself a dialogue and transforms computerized procedures into computer-aided ones. This is simply not true. For example, let us suppose you desire the average apartment-to-parking-space distance for some design project. In a batch processing mode (presuming the program exists), you supply as data the description of your design and the answer returns hours later—indeed a computerized proce-

dure. On the other hand, in a "real-time" environment, the project description resides in the machine, and you simply type on your teletype terminal the apartment-to-parking distance command.

But just because the answer comes back in three seconds rather than three days, "computerized" does not become "computer-aided." It simply becomes more convenient. Computer-aidedness demands a dialogue; events cannot be merely a fast-time manifestation of cause and effect.

On-line communication, therefore, is not a sufficient (though necessary) condition for a computer-aided environment. Computer-aided design requires three further features: mutual interruptibility for man and for machine, local and dedicated computing power within the terminal, and a machine intelligence.

Interruptibility gives a dimension of interaction that allows the process, as well as the product, to be manipulated. In a computer-aided system, the machine may interrupt the user and present unsolicited information—for example, that the cost of his low-income housing project is \$38 per square foot. The apparent high cost might have been due to inadequacies in the original estimating routine provided for the computer; for instance, substantial indirect savings might have been overlooked. In this case, the designer could tamper with the estimating routine and incorporate hitherto neglected parameters. Thus the architect might welcome the remark, ignore it, or take offense and request that such interludes of finance be restricted.

Unfortunately, the present time-sharing philosophy fosters a cause-and-effect conversation. Time-sharing assumes that a designer's explicit manipulations will occupy between 1 and 10 per cent of any sitting; the remaining time represents his deliberations and distractions. Each user's moments of contemplation are in effect another user's instants of computation. A designer can interrupt his

own program, but a routine cannot easily interrupt its partner-in-thought. This is because, in order to leave the computational utility available for other users, each routine resides in the machine only when explicitly called into service by its particular user. In other words, the user's machines—are encouraged to listen, but not to interrupt.

To retain assets of "time-sharing," while avoiding the anathema of batch processing, and to acquire mutual interruptibility, we must adjust the allocation of computing power. Some information processing power and a certain manipulative and storage capacity must be transferred to the terminal that was originally a teletype transmission and receptive device. This semi-autonomous terminal (possibly portable) would become a small computer that would be a "machine in residence." An Architecture Machine would be such a machine. The designer would speak directly to this satellite machine. In turn, this small remote computer would interactively converse with larger parent machines. (Sending out work to a central mechanism would not be apparent to the designer; his Architecture Machine would elect this course for reasons of speed, memory, information, or all three.)

It is the Architecture Machine in residence, located in habitation with the designer, which would undergo the personalization. It would be composed of additive and subtractive pieces of hardware as determined by the discipline of its partner. The local consortium of parts would do the interrupting, the dialoguing, and the evolving. Observe that the interrupting and the reinterrupting would be dependent on the nature of the designer's activities, on the context of his efforts. Through familiarity with the specific designer's idiosyncrasies, the appropriateness of the machine's interruptions can be suitably reinforced by context; this is the inception of an intelligent act.

A mechanical partner, as we have suggested, must have intelligence. Customarily, computer-aided design studies and intelligent automata studies

have been antipodal efforts. On the one hand, we are told to render unto each their respective design functions and talents: man (intelligent) thinks and the machine (dumb, fast) calculates. On the other hand, we are told that, "Anything you can do, a machine can do better."

The two outlooks are not necessarily contradictory. There is a real issue whether machine intelligence can be independent of human intelligence. In computer-aided design, only the combination of mechanical amplification and mechanical imitation will validate the dialogue. The dialogue will evolve an intelligence, this intelligence will stimulate a more profound dialogue, which in turn will promote further intelligence, and so on. Furthermore, the concurrence of "extended designer" and "artificial designer" will force a design redundancy and an overlapping of tasks which are necessary for the understanding of intricate design couplings. Perpetual cross-examination of ideas by both the man and the machine will encourage creative thought that would otherwise be extinguished by the lack of an antagonistic (thus challenging) environment. Computer-aided design concerns an ecology of mutual design complementation, augmentation, and substitution.

Vis-à-Vis Machine Intelligence

Intelligence is a particularly difficult behavior to emulate in machines because of its extreme dependence on context—time, locality, culture, etc. A sophisticated set of sensors, effectors, and processors is needed to view the real world (directly or indirectly) and to discern changes in meaning brought about by changes in context—in other words, to be intelligent.

For example, the meaning of a metaphor (in the physical environment, in a story, in a painting) is conveyed through context, and the assessment of such meaning is an example of an intelligent act. (Note that a literary metaphor characterizes the era and the culture in which it was written.) One might judge a machine's intelligence (not neces-

sarily its maturity, wisdom, or knowledge) by its ability to appreciate a joke—a joke being a funny story with a punch line that is an about-face in context. As humans we exhibit an intelligence by tracing back through previous metaphors of the tale and deriving pleasure from the new meanings revealed and brought on by a shift in context. (Note that people of different cultures have difficulty in understanding each other's jokes.)

Some architects might propose that machines cannot design unless they can think, cannot think unless they want, and cannot want unless they have bodies and, since they do not have bodies, they therefore cannot want, thus cannot think, thus cannot design—*quod erat demonstrandum*. The argument, however, is usually an emotional issue rather than a logical conclusion. Nonetheless, the reader must recognize (if he is a "machine-intelligence" enthusiast) that theories on machine intelligence can, at this time, best be supported with such examples as computers playing a superb game of checkers and a mediocre game of chess. And furthermore, architecture, unlike checkers (with fixed rules and a fixed number of pieces) and much like a joke (determined by context), is the croquet game in *Alice in Wonderland*, where the Queen of Hearts (society, technology, economics) keeps changing the rules.

Let us not be misled. We are not interested in a machine that will simply parrot a human designer, nor are we interested in a machine that will have an autonomous existence by which to mimic and replace an architect. An Architecture Machine will feature a dependence. An artificial intelligence is in fact an interdependence.

You might summarize the proposition here as being: For machines to contribute to an environmental humanism, they must have a "natural dialogue" with a human designer, natural because they need his metaphors and natural because they need his ideas unmutated. The dialogue, in turn, must reside within a computer-aided (not computerized)

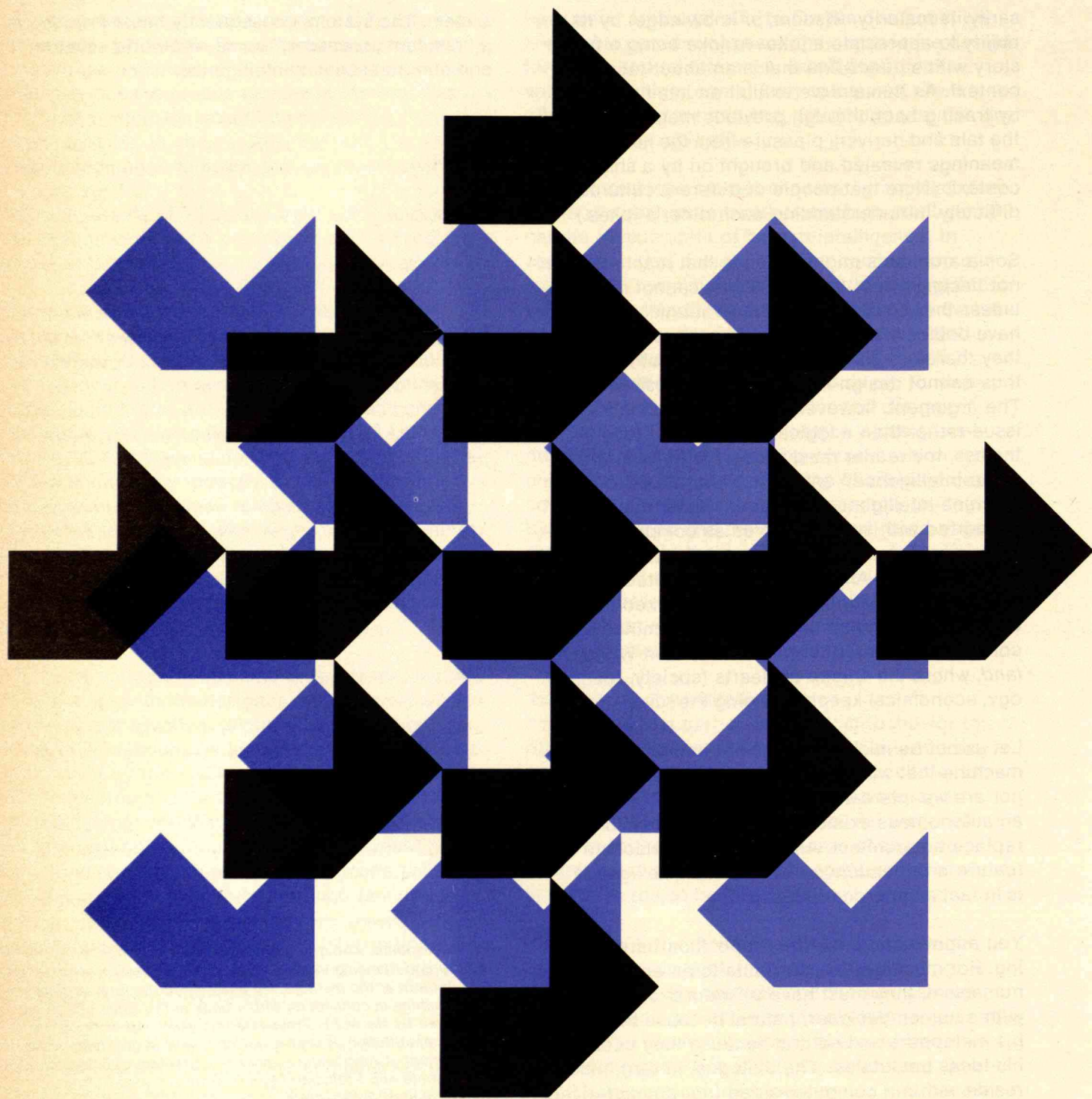
system. The system, consequently, must include a "resident processor," some real-world sensors and effectors, and an intelligence.

Mr. NegroponTE, who graduated from M.I.T.'s School of Architecture and Planning in 1966, is Assistant Professor of Architecture at the Institute. He has coined the term Architecture Machine in connection with a book of the same title to be published by the M.I.T. Press late this year, and work on the actual construction of such a device is now in progress in the Department of Architecture under the direction of Professor NegroponTE and Professor Leon B. Groisser, also of the Department of Architecture.

The computer can be a force for homogenization or individuation of our lives. But its ultimate threat is to those deprived of its power

Joseph Weizenbaum
Associate Professor of Electrical Engineering and
of Political Science, M.I.T.

The Two Cultures of the Computer Age



Suppose we had asked 50 years ago how photography was to affect how and where we live. Perhaps we would have perceived photography as being fundamentally a communication technology. Still, I doubt that any of us would have had sufficient foresight to extrapolate from the then-current photographic techniques and practices to today's global television networks.

I do not intend to stretch an analogy too far, but surely we do see now that the technology that is electronic photography—i.e., television—has had enormous and, I would say, irreversible effects on each of our lives. It has profoundly altered the practice of politics in our country. Insofar as it brings what we call entertainment into our homes, it surely has also affected our choice of where we wish to live. And, more importantly, by allowing even the disadvantaged members of our society to vicariously experience the good life we pretend is our national standard, we have unleashed social forces of immeasurable magnitude.

The automobile is another piece of technology that has profoundly altered our way of life within a few generations. When we notice that the machine itself—the automobile—has changed relatively little since its mass production began, we are brought sharply face to face with the fact that, while it may be possible to predict with some confidence a path of technological development of a particular machine, that alone says nothing about our ability to predict its social consequences.

The computer is a child *par excellence* of our era of fantastically rapidly expanding technology. One of the first computers I worked on had a storage capacity of 800 words with an access time of about 20 milliseconds. It fully occupied a very large room and required an elaborate cooling plant. Its cost was about \$750,000. A computer of the same memory capacity but 20,000 times faster is today an off-the-shelf sub-component costing under \$10,000.

All of the above is an ill-disguised plea to be let off the prediction hook. To put it another way: the technologist himself is perhaps the poorest prepared to forecast the consequences of his technology. The fact is simply that the side effects of technological progress eventually dominate by far the direct effects predictable on the basis of technology itself. And to perceive potential large-scale side effects requires a different insight than that which is the natural by-product of an individual's preoccupation with technology. (It is, by the way, precisely for such reasons that questions over the responsibility of the scientist are becoming ever more urgent and that the very concept of a university devoted entirely to science and technology is no longer viable.)

Having disqualified myself, I may safely begin my analyses.

Rescuing Man From His Growth

The computer has at present no effect on *where* we live. But already it affects *how* we live. The first bank deposit accounting computer system was built by the General Electric Company for the Bank of America about 13 years ago. At that time, the bank said that unless the deposit accounting process was soon automated, every adult living in California would have to be hired by the bank to help do its bookkeeping. I cite this in order to show that there are certain normal activities we carry on—apparently just as always—which would have ground to a halt were it not for computer intervention. Perhaps the handling of airline and hotel reservations is another example. The effect then is not very visible—it is merely that we can carry on. It is only when the foresight exercised—by Al Zipf of the Bank of America in that example—is not forthcoming in time that the effects become dramatic. I have in mind the fact that trading in the New York Stock Exchange has had to be repeatedly suspended lately to permit the data processing to catch up with the data flow.

"To merely carry on" sounds so banal. But we must from now on remember the absolutely most overriding fact of our time: we are on the exponential of the population growth curve—both here in the United States and in the world. If—and I emphasize the "if"—the computer permits us to maintain our production and distribution, our finance and our vital statistical services, then that alone will have justified its existence. But I personally do not believe that even an arbitrary growth in national computational capacity will prevent a drastic degradation of our present life style in the face of the population explosion without a simultaneous implementation of social inventions of the highest order of imaginativeness.

The computer, in other words, is a life boat that arrived on the horizon in the nick of time. It is a necessary part of the rescue machinery—but not a sufficient one.

Homogenization vs. Individuation

Another threat facing us as a result of the population explosion is that, even if we can manage to keep our society going in some way, life could become very drab, monotonous, dull. We are in fact experiencing a homogenization of life styles of considerable proportions as it is. There may be some comfort in knowing that a Holiday Inn near Coral Gables, Florida, is indistinguishable from another near Vernal, Utah, or that one cannot tell when waking up in a Hilton Hotel room whether one is in Berlin, Chicago, or Tokyo—but those circum-

stances certainly derate the old adage that travel broadens one.

I have never made the computation, but I would guess that the number of different cars one can today specify from, say, General Motors, exceeds their total annual production of automobiles. With the multiplicity of options available with respect to engine size, transmission type, upholstery, exterior and interior colors, and so on *ad infinitum*, it is surprising that any two new cars are exactly like one another. The important point is, of course, not that modern cars have their individuality. It is that the computer-controlled assembly line is making it possible to combine mass production with custom tailoring, so to speak. And the measure of near uniqueness achievable even today is enough to shame an old-time craftsman (if one could be found to witness the phenomenon). Here the computer is performing a service that is more than a holding action and in this area we have reason for considerable optimism.

Let me state quite clearly that we are in the grip of two opposing forces—the one due to the population explosion and running virtually out of control tending to homogenize life, and the other available for us to use at all or not, or wisely or stupidly, that could lead to the enrichment of life through individuation.

Extending Man's Perception and Understanding

The wise application of computing resources can mean not merely an enormous differentiation of the products we consume and the houses and even communities we live in, but of our intellectual and ultimately our emotional lives as well. An example is the enormous impact computers can make in the life-long educational process of the individual. For we can now foresee an educational system which has as its one grand objective to aid the individual in achieving self-identification. Even late in life, when the computing system has learned so much about him, the individual can use it to, in a sense, consolidate his gains, to review his life and in effect

compose the novel his life, like each of our lives, really is.

A similar individuating effect can be achieved in each of our perceptions of the world around us. We know that the television news broadcast must of necessity restrict itself to reporting those events in which the largest number of people can be presumed to have an interest. It serves the mass man and is therefore a homogenizing force. The newspaper can be broader in its coverage and attempt to report all the news it deems "fit to print." But once a story becomes stale, no follow-up reporting is done. The election, for example, was no longer interesting one week later. Where could I look then to find out whether Senator Morse finally won or lost in Oregon? A computer system could make it possible for me to keep up with facts that interested me. After it came to know me, so to speak, it could even alert me to developments that I as an individual would find interesting.

We do have newspapers today that cater to special audiences, such as the *Wall Street Journal* and *Women's Wear Daily*. We will soon have the technology to permit the publication of individuated versions, say, of the *New York Times*, which have arrived at their individual styles and contents on the basis of readers' feedback to the publisher. I do not believe that task to be harder than the production miracle Detroit is currently achieving with respect to automobiles.

A Return to the "Cottage Industry"

Let me turn briefly to the question of the impact the computer may have on where we live. I can foresee a return to a kind of cottage industry. For five years now I have had in my home a console attached to the MAC I.B.M. 7094 computer operated by M.I.T.'s Project MAC. There have been many days when I skipped the drive to Cambridge—I live about 20 miles from my office—in order to do my computer work at home. More important from the point of view of portents for the future, there have been many occasions when students and I worked on programs jointly while they were in Cambridge and I was at home and we were all linked through the MAC computer. Dr. Engelhardt of the Stanford Research Institute in Menlo Park, Calif., has an ongoing experiment that clearly demonstrates the feasibility of a computer forming the cohesive element binding together a team of engineers whose members are physically remote from one another. If we are lucky, it may turn out that just when our land and air traffic is at the point of choking us to death, large concerns will have made it possible for their engineers to stay at home—almost no matter where home is.

That many homes will, in the not too distant future,

be equipped with computer consoles—of that there can be no doubt. I believe the home television set will be tied to the telephone and hence to local, state, and national computer services. Much man-computer communication will be in the graphic mode. I suppose that the cost of many of such home consoles and their attendant line and other charges will be borne by the employers of members of the household. But this does not preclude the possibility that a major use of the console will be for entirely personal matters such as shopping, self-education, getting advice of all sorts (including medical advice—from an electronic Dr. Spock), and so on.

New Economics—and New Illiteracy

But not all homes will be so equipped—perhaps not even most homes. I mention this especially in order to point up a serious and dangerous problem we almost certainly have to face, starting right now.

Daniel Bell, in a future issue, will deal with the idea that knowledge is power. We are, in his words, becoming a knowledge society. It is perfectly clear that the access to information is necessary to exercise this power of knowledge. Individuals can therefore be rendered impotent in tomorrow's society simply by being denied access to public computing utilities. One implication of that fact is that information and the power to transform information will become an enormously important resource. We may see a new kind of economics growing up in parallel with the money-based economics we know now—one in which the medium of exchange is time allotments on the national computer utility. I can imagine, for example, that a prize for superior scientific achievement on the part of a research worker might include a few hours of free computer time.

But if the power to manipulate information in a large computer system is really translatable into social and political power, what about that segment of the population that cannot use computing power for lack of training?

They will find themselves in a very isolated position indeed—in an important sense they will be the illiterates of the new society. Perhaps the closest modern Western society has come to having such a population in its midst was during the Nazi German period after Jews were forbidden to use the mails and telephone services. They were thereafter completely cut off from the economic life of the nation.

The danger we face is, to use Daniel Bell's phrase, that we will be creating a new cleavage in society. A large part of our population will enjoy a high standard of living—limited, to be sure, by intense population pressures—and experience the kind of élan that accompanies the sense of full participa-

tion in one's society. Meanwhile, the remaining and potentially very large segment of the population will drift further and further away from playing any but the most menial and irrelevant roles and will fall behind at an increasing rate. The magnitude of the social strains this condition can generate is, I believe, presently unimaginable.

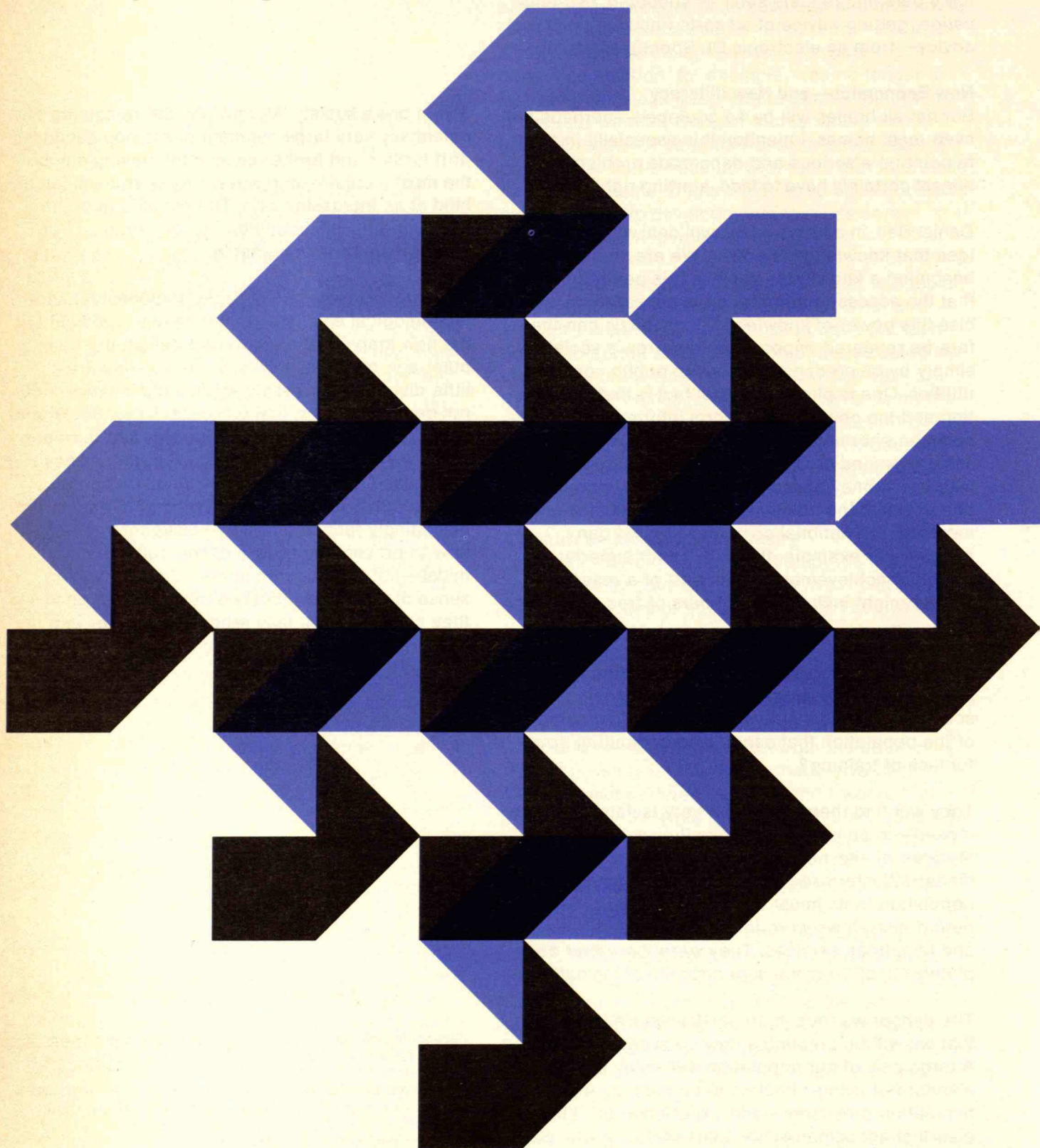
We, who are members of today's intellectual and technological elite, may find it easy to speculate on the new marvels of comfort and delight the computer age offers us. Perhaps our reveries are a little disturbed by threats against our privacy. I do not doubt, however, that our capacity for social and political innovation will take us over that hurdle if we so wish it. I think it more appropriate, however—and indeed necessary—to challenge thoughtful technologists and those who work with them to unhesitatingly face and begin to solve the problem of how to prevent the growth of two cultures in our midst—not two cultures in the relatively benign sense of C. P. Snow, but two cultures that, once they come to exist, may render each other into waste.

Joseph Weizenbaum was educated at Wayne State University and had broad industrial experience in computer systems and applications before joining the M.I.T. faculty in 1964. Since then he has been associated with the Institute's Project MAC and with work in the application of computers to the study of political systems, and he has taught in the Departments of Electrical Engineering and Political Science.

The problem of software illustrates how computing needs professionalism just as the professions need computing

Edward E. David, Jr.
Executive Director, Research
Communications Systems Division
Bell Telephone Laboratories, Inc.

Computing and the Professions



Few of us would doubt that computing is having an increasing impact on the professions. Many of the influences are peculiar to one profession or another, but the most pervasive influence—one that cuts across most if not all—is simply that computing is forcing a more rational approach on the professional. For example, in assessing the elasticity of a market today, the marketing professional is less likely to depend upon a seat-of-the-pants opinion and more likely to consult a computer model of the market supplemented with information from a market survey. The military planner, in determining appropriate levels for his various forces, relies less upon the convictions of his generals and admirals and more upon computer studies of conflict situations and estimates of the performance of opposing forces.

Needless to say, this transition is not without its frictions and disputes between “old pros” and “young Turks.” The “pros” fear that computed results are often accepted as authoritative just because they come from the “Great Brain,” and this fear leads them to denunciations of the “garbage-in-garbage-out” variety. The “young Turks” must admit that there are real dangers here—dangers of uncritical acceptance and uncritical rejection.

In fact, all recognize that salvation here lies in a balanced approach, a middle view which James Schesinger of Rand Corporation calls “2½ cheers for computer analysis.” In outline, it goes as follows: computer models and data do not lead to a scientific procedure for making decisions without using intuitive elements. Rather, they provide a mechanism for sharpening the intuitions of the decision maker. The objective of computer analysis of situations, then, is to quantify common sense and make it explicit. However, as some wag has said, “intuition and common sense are fine as long as they’re right.” The models and data represented in the computer must be congruent with the mechanics of the real world. For many problems in many professions our knowledge is insufficient for good modeling, and our measurement techniques

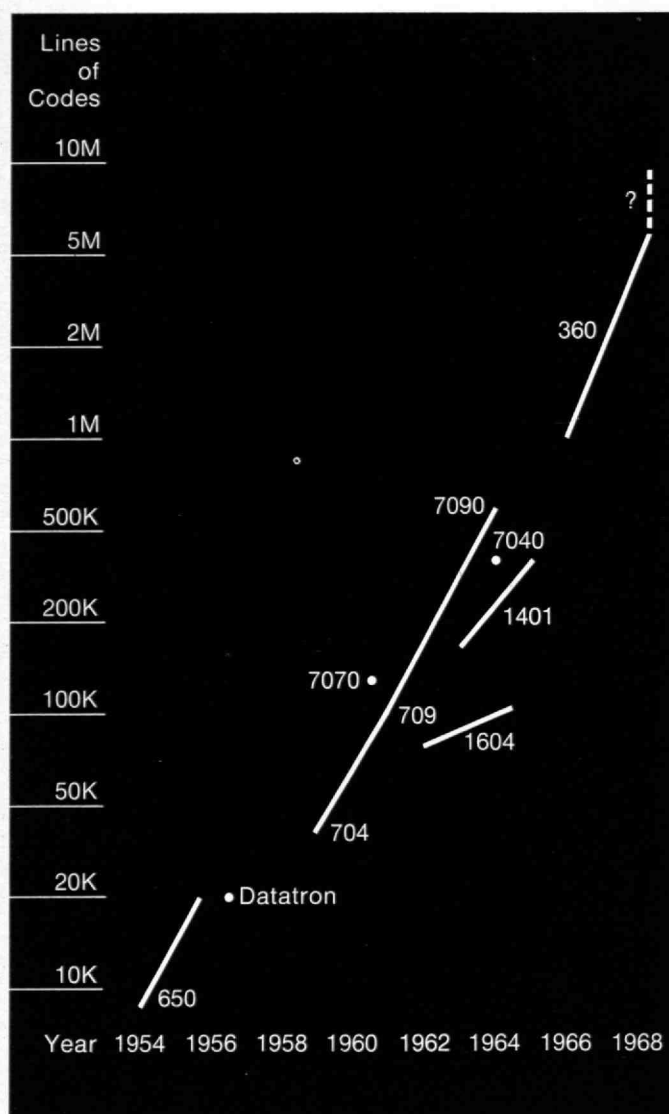
are inadequate. This situation limits the power of computer analysis and puts an increasing burden on informed judgment. The wise balance depends upon the state-of-knowledge in the particular professional field.

All this moderation is easy to accept in the abstract. Putting it into practice is another matter. To strike the proper balance, perspective and excellence are vital *not only* within the target professional field *but also* from the computing community itself. Thus, the influence of computing on the professions can be only as great as the professions’ influence on computing. In short, as computing invades the professions, computing itself must acquire a professionalism of excellence and responsibility which goes well beyond what we see in the industry at the present time. A failure to develop this excellence and responsibility could be disastrous not only to computing but to the professions that it touches.

The increasing complexity of computing systems is generating increasing demands on computing professionals. These systems consist of both hardware and software—machines and programs to animate them. The machines are becoming more capable, faster, and more capacious daily, and the cost per computing operation is decreasing. However, by far the greatest increase in complexity is occurring in the software to run these machines. We have measures only of the increasing size of operating systems for various computers over the past 12 years (see the chart), but complexity goes along with growth, and size may be as good a measure of complexity as we have at the moment.

As software systems have grown and become more complex, they are assuming more and more crucial roles. For example air-traffic control and hospital intensive-care units place a premium on reliability and fail-safe operation. Economy and timeliness are vital in other instances—the operation of stock exchanges, airline reservation systems, and law-case retrieval systems. In many applications, failures, delays, and errors can be catastrophic. A review of

Growth in software requirements. Professor Robert McClure of Southern Methodist University has developed data to show that computer software requirements have followed an exponential growth—doubling every 12 months—since 1956. It is hard to imagine that any improvement in hardware or method can keep up with this rapid growth; must we inevitably conclude that everyone in the world will soon be programming software?



some of the problems will provide an assessment of our present state of the art.

Software: Panic Without Limitation

Production of large software has become a scare item for management—a field with a reputation as a costly, unending, unprofitable morass. This reputation may well be deserved. It has been said that software development costs equal hardware development costs in establishing a new machine line.

Many software projects have been “decommitted”—that is, they have failed to materialize.

Clearly, regardless of how brave or cowardly the system planners happen to be, they do face difficulties—problems of scale—in undertaking large software projects. These would not be so frightening if we could at least place limits beforehand on the effort and cost required to complete a software task. Experience indicates, however, that estimates of the effort (man-years) to complete tasks involving new software concepts are likely to be low by factors of two to four, and we see no change in the immediate future. When one considers that a change of 20 to 50 per cent in software item can mean the difference between profitable and deficit operation, one can indeed sympathize with the person who must commit his company or himself to such a task.

Many factors contribute to this situation. There is no theory which enables us to calculate limits on the size, performance, or complexity of software. In many instances, there is no way even to specify in a logically tight way what the software product is supposed to do or how it is to do it. We can wish that we had the equivalent of Shannon’s information theorems which tell how much information can be transmitted over a channel of given bandwidth and signal-to-noise ratio, or Winograd’s theorem specifying the minimum addition time given the switching and delay times in the basic circuitry, but there are as yet no such existence limits for software.

It also turns out that system programmers vary widely in their productivity. An experiment by System Development Corporation indicates the following range of performance by 12 programmers with 2 to 11 years’ experience in completing the solution to a specific problem:

Performance	Worst/Best
Debug time used	26/1
Computer time used	10/1
Coding time	25/1
Code size	5/1
Running time	15/1

These figures confirm my own informal observations. Of course, individual talent varies, and this is traditionally reflected in promotions and dismissals. Yet in software projects talent is often so scarce that marginal people are welcome. More to the point, the range of productivity indicated above seems quite large compared to that expected or tolerated on a hardware project, and this increases the difficulty of accurate estimation and emphasizes the software problem.

Computing has one property—unique, I think—

which seriously aggravates the uncertainties associated with software efforts. In computing, the research, development and production phases are often telescoped into one process. In the competitive rush to make the latest techniques available, such as on-line consoles served by time-shared computers, we strive to take great forward leaps across gulfs of unknown width and depth. In the cold light of day, we know that a step-by-step approach separating research and development from production is less risky and more likely to be successful. Experience indeed indicates that for software tasks which are similar to previous ones, estimates are accurate to within 10 to 30 per cent in many cases. This situation is familiar in all fields lacking a firm theoretical base.

Thus, there are good reasons why software tasks involving novel concepts involve not only uncalculated but also uncalculable risks.

Wanted: Reliability and Portability

Some additional data about program production are worth registering. The average programmer's productivity varies with the type of programming; unconventional jobs take longer. The problem of software reliability presents a picture not dissimilar to that of software production. This problem came to national attention during the 1968 elections when, as the *New York Times* reported, "the principal computers in a vast electronic tallying network spewed out erroneous figures and were removed from service. . . ." The clipping in the illustration gives details of the frustration; note especially the comment of J. Richard Eimers, Executive Director of the News Election Service, blaming the difficulty on programming. The *Times* said that "more than 10,000 man-hours were understood to have been consumed in programming . . . and there was no telling when the difficulties that manifested themselves Tuesday night might be pinpointed."

The fact is that we do not have design and implementation techniques to achieve a predictable reliability. Communication engineers would never

Vote Computers

By LAWRENCE VAN GELDER

An autopsy on a pair of electronic slaves was in progress yesterday to determine why the best laid plans of men had failed to compel them to perform their assigned roles as the nation's prime disseminators of accurate, uniform vote counts in Tuesday's election.

Drama and suspense normally accompanying a close Presidential race were intensified when the principal computers in a vast electronic tallying network spewed out erroneous figures and were removed from service, forcing a switch to a slower backup system.

The computers themselves—two International Business Machines System 360 Model 40 computers—were quickly absolved of blame by the chief executive of the News Election Service, the cooperative organization formed by major news media to insure a single set of accurate totals.

"I am quite certain," said J. Richard Eimers, the weary 50-year-old executive director of N. E. S. who held himself responsible for the system's failure, "that the difficulty was in programming."

Hours of Programming

More than 10,000 man-hours were understood to have been consumed in programming, or drafting the coded instructions of humans designed to control the behavior of the machines; and there was no telling when the difficulties that manifested themselves Tuesday night might be pinpointed.

Nevertheless, Mr. Eimers said there was no reason to believe that any state whose electoral votes are now assigned to one or another of the Presidential candidates might have to be assigned to a different column because of error in the tabulation process.

"I really think that the national total we put out was correct all the way, except we got some weird figures in state fig-

ures," said the sole executive of the cooperative established in 1964 by The Associated Press, the American Broadcasting Company, the Columbia Broadcasting System, the National Broadcasting Company and United Press International.

Mr. Eimers, a former A.P. bureau chief in Portland, Ore., and Baltimore added that there was no reason to believe Tuesday's difficulties would lead to any alteration in the outcome of state contests. A recheck of the results was begun yesterday.

The actual programming of the system was carried out by Programming Methods, Inc., of 51 Madison Avenue, whose president, George Langness, said late yesterday that the error had been located in some part of the program dealing with the number of precincts reporting.

Mr. Langness said the program had undergone a months long process of debugging, or testing to uncover flaws.

Programming is acknowledged to be a meticulous art. Instructions to the computer are usually written by hand in symbolic form and then fed into the computer by means of a typewriter, tape recorder or similar machine. Through this coded shorthand, the computer is told what operations to perform and what data to employ in performing the operations.

The instructions in electronic code are represented within the machine by combinations of different magnetic states.

Both the instructions and the data are stored in the computer's memory at specific locations, known as addresses. When the machine is started, the instructions determine the computer circuits that will be called upon to solve a problem, and the computer does its calculations in an orderly sequence, moving from address to address in its memory. At each address it picks up instructions, follows them and then goes back for more instructions.

think of designing a digital transmission system without fixing its error rate in terms of the system parameters. In the same sense, operating software has an error rate in practice. Yet there is no way to design to an error specification, and there is no way of measuring the residual probability of error at any time in the life of the software. The early naive view that software, as a logical structure, can be made faultless proves to be patently untrue. Yet the consequences of failure in large software is becoming prohibitive.

This situation is aggravated by the almost unlimited expectations of politicians, business leaders, and professionals of all kinds. One has only to open a magazine or book to find statements by leaders of the society based upon a presumed in-being technology of software. For example, John Lindsay says in *Life* that one solution to the rising crime rate is information processing technology, and J. J. Servan-Schreiber believes that the major impetus toward European federalization lies in computer-based information systems. Just how realistic such expectations are depends upon the degree of professionalism exhibited by computing people.

Still another unfavorable element in the software picture is its lack of portability. Massive amounts of software, good and poor, have been produced over the past 10 to 15 years. The best are some of the most creative contributions to all of technology and science. Yet most of these are effectively lost to the wider community because software cannot be transferred easily from one computing facility to another. Only with difficulty can software be exported from its original environment. There are, of course, some exceptions; but in general the situation does not encourage sharing of software resources. As one of the elder statesmen of computing says, "In software, we do not stand on the shoulders of those who precede us, we stand on their feet." This situation has become known as "the compatibility problem."

It is significant, too, that there do not exist today software components in the sense that we have hardware components from which systems can be assembled. Essentially, each large software system must be created from scratch.

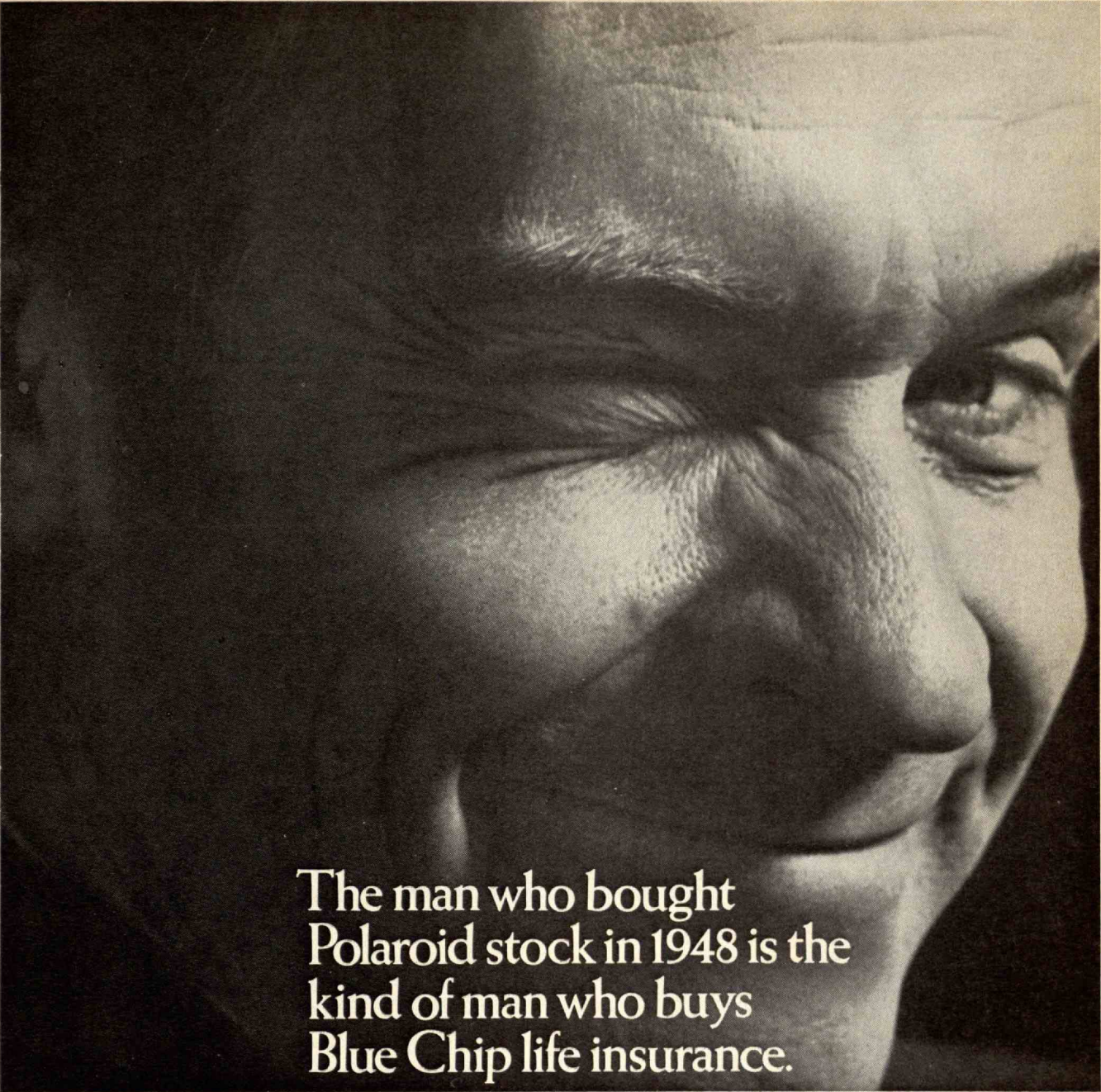
Toward a Science of Software

None of these problems relating to software production, reliability, and portability is news to people in the field. Fortunately there are some interesting ideas that could contribute to solutions in a basic way. This is another way of saying that research relevant to these problems needs encouragement. However, until such time as we make some major advances in understanding, the software field

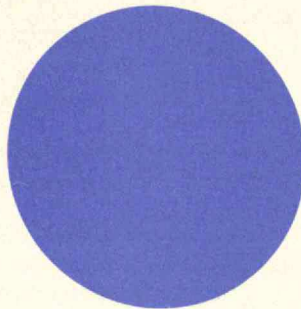
should be recognized for what it is—a collection of largely empirical techniques which may or may not be effective in any given instance. To survive and to serve effectively, such a technique-oriented field must have a strong professional ethic, one which insists on realism rather than promises, that separates speculation from fact, and that clearly separates research from product development. Only such professionalism can prevent the field from being overwhelmed by ever-increasing demands on one side and ever-increasing problems on the other. Classical engineering is similarly technique-oriented, yet U.S. engineers, particularly those associated with professional societies, still doubt that software is a legitimate engineering product, and even among university people in the academic departments, particularly computing science departments, I find only scattered interest in professionalism.

I do not take a doomsday view of the situation. We need to strive for basic understanding in the software field. But until software engineering becomes software science, the shape of computing's influence on the professions will be constructive or destructive, depending upon the degree of professionalism and responsibility within the computing community itself.

Edward E. David, Jr., joined Bell Telephone Laboratories in 1950 after graduate study (S.M.'47, Sc.D.'50) at M.I.T. The author of many technical articles on communication theory, speech, hearing, speech recognition and processing, vocoders and computing, Dr. David is co-author of two books—Man's World of Sound and Waves and the Ear. Since 1963 he has specialized in computing science research, working on advanced computing techniques and especially on "man-machine communication."



The man who bought
Polaroid stock in 1948 is the
kind of man who buys
Blue Chip life insurance.



He's a man who's a shrewd judge of value. And that's what he gets from his Connecticut Mutual life insurance. The highest quality coverage at just about the lowest net cost (proved in latest industry study, 1948-68). That's what shrewd investment is all about.

Connecticut Mutual Life
the Blue Chip company

YOUR FELLOW ALUMNI NOW WITH CML

Richard E. Boraks '59 Hartford

Ralph Mendel Grad. School New York

$$E=mc^2$$

FORGET IT.

No equation should ever appear in your advertising. Unless you want to communicate mainly with scientific professionals. As we do now.

Einstein's theory has little meaning for most managers in business, industry, finance and government. They recognize his equation. The symbols, however, strike no strong resonance.

Yet these administrators often have the make-or-break influence over technical products and services. And, to reach them effectively, your message must stir reactions far greater than mere recognition.

This is a job for specialists. Like our people at CH&M Communications, Inc.

We know how to translate advanced technology into graphics and writing that make the most of the varied interests and backgrounds found on the many different levels of the technical market.

So, when we create a capabilities brochure, we do it

without talking down to the technical man or over the head of the businessman.

In public relations, we speak to the point with programs that produce repeated and regular impact on your various audiences.

In advertising, we manage the most difficult of feats, generating inquiries from serious prospects while screening out casual literature collectors.

These are the things we can do for you. In the markets that mean the most to you.

Since problems of commercial communications have not yet been wrapped up as neatly as $E=mc^2$, we think you'll find it profitable to explore yours with us. Please write or call:



Peter E. Hermann, President
CH&M Communications, Inc.
150 East 52nd Street,
New York, N.Y. 10022
Tel.: (212) 752-0323

picking a computer is like picking a wife



It's serious business. Are you really compatible? Will each of you grow in the same directions? Can you afford her?

DIGITAL offers an exceptionally broad choice of computer-wives. Large, massive memory, high power machines like the PDP-10. And on the other end of the scale, small machines like the PDP-8/L with long histories, massive software support, an active couples club that meets regularly to discuss family problems and solutions.

For the man who needs the closest relationship, constant reminders of

what needs to be done, there is the English speaking PDP-12. And for the man who wants to do most of the thinking in the family, yet wants that family instantly capable, instantly responsive, there are the PDP-9 and PDP-9/L.

And lastly if you're the type that wants to know nothing, yet get the job done, there is the whole range of special purpose Computerpacks. For signal averaging, gas chromatography, and eight other special applications.

Like marriage, the question often is — what kind of a man are you?

DIGITAL EQUIPMENT CORPORATION, Maynard, Massachusetts 01754, Telephone: (617) 897-5111 — Cambridge, Mass. • New Haven, Conn. • Rochester, N.Y. • New York City • Long Island, N.Y. • Princeton, Parsippany, N.J. • Washington, D.C. • Cocoa, Fla. • Atlanta • Knoxville, Tenn. • Huntsville • Philadelphia • Pittsburgh • Cleveland • Dayton • Chicago • Minneapolis • Ann Arbor • Houston • Dallas • Salt Lake City • Denver • Albuquerque • Los Angeles • San Francisco • Seattle. INTERNATIONAL, Ottawa • Toronto • Montreal • Edmonton • Reading • Manchester • Paris • Munich • Cologne • The Hague • Stockholm • Milan • Sydney • West Perth • Melbourne • Tokyo.

digital
COMPUTERS • MODULES

**At ITT Nutley you can work on...
Antenna Development,
Infrared Systems Engineering
and Components, Advanced
Electronic Warfare Systems,
Active Electronic Countermeasures,
Acoustic Electronic Counter-
measures, Electronic Trainers
and Simulators, TACAN,
LORAN, OMEGA, and
Microelectronics Engineering.**

We have openings for people with EE, ME, IE, or Physics degrees and 3 to 10 years' experience in any of these areas: design, development, systems integration, or manufacturing engineering.

Decisions
Decisions
Decisions



You need information to make them. Like the fact that ITT Nutley is located in northern New Jersey just 20 minutes from New York City. For additional decision making information about ITT Nutley, please forward your resume in complete confidence to Mr. Wally Bieszard, ITT Avionics Division, 390 Washington Avenue, Nutley, New Jersey 07110. A Plans for Progress Equal Opportunity Employer (m/f)

AVIONICS DIVISION ITT

INTERESTED IN COMPUTERS?

If you're looking for exposure to the newest concepts, latest equipment, most advanced techniques and the real world of computing . . .



Come to PHI to investigate career opportunities in one of the fastest growing and most exciting industries in today's dynamic world.

As New England's leading software firm, programming is our business; it is not a support activity. The work is challenging and the rewards gratifying. Benefits are exceptional. They include annual bonus, profit sharing and growth in professional responsibilities.

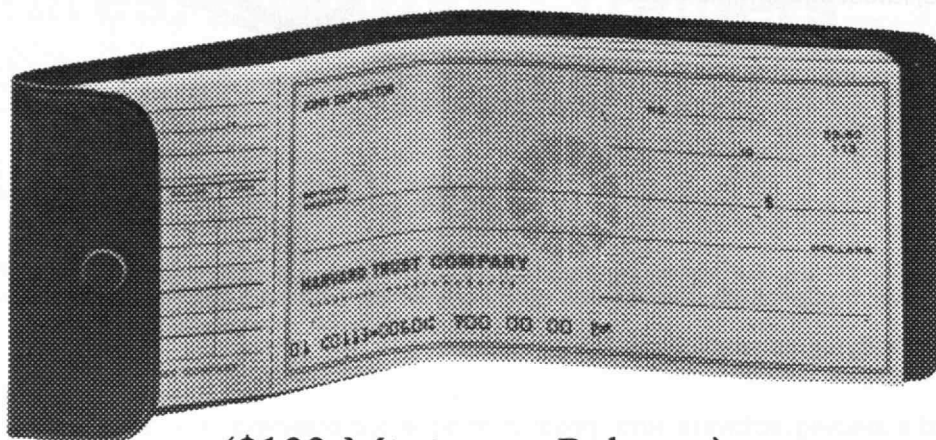
Please call or write Dr. Murray E. Sherry.



PHILIP HANKINS INCORPORATED / COMPUTER CONSULTING AND SERVICES
800 MASSACHUSETTS AVENUE, ARLINGTON, MASSACHUSETTS 02174 • 617-648-8550

A SUBSIDIARY OF **WANG** LABORATORIES, INC.

service charge free checking



(\$100 Minimum Balance)

Available for individual or joint personal accounts. Write for free booklet, "YOUR CHOICE CHECKING ACCOUNTS" . . . or ask for it at any one of our convenient offices.

Write: HARVARD TRUST COMPANY, P. O. Box 300,
Cambridge, Mass. 02139



"Your shortest path . . . to person-to-person banking."

HARVARD TRUST COMPANY

Cambridge, Arlington, Belmont, Concord, and Littleton.

Member F.D.I.C. • Federal Reserve System

AVCO IS INSTALLING AN IBM 360/85

IT FIGURES!

WHEN YOU'RE COMMITTED TO THE CONCEPT OF TOTAL COMPUTER SERVICE, AS AVCO IS, YOU'VE GOT TO KEEP PACE WITH THE NEWEST DEVELOPMENTS IN THE FIELD. THAT'S WHY THE FIRST IBM 360/85 IN NEW ENGLAND IS BEING INSTALLED AT OUR WILMINGTON CENTER. WE'RE PRETTY EXCITED ABOUT IT EVEN THOUGH IT'S OUR NINTH THIRD GENERATION COMPUTER.

BUT, THEY'RE ONLY A PART OF WHAT WE MEAN BY TOTAL COMPUTER SERVICE. THERE'S A LOT MORE.

LIKE REMOTE JOB ENTRY WHICH PERMITS YOU DIRECT ACCESS TO OUR CENTRAL COMPUTER FROM YOUR LOCATION.

LIKE AN ADVANCED DIGITAL GRAPHICS CAPABILITY USING OUR SC 4020. AND COMPUTER MICROMATION — OUR SOLUTION TO YOUR PAPER PROBLEM. AND COMMERCIAL, SCIENTIFIC AND ENGINEERING PACKAGED PROGRAMS AND APPLICATIONS.

LIKE A WORK CENTER RIGHT IN CAMBRIDGE.

AND, MOST IMPORTANT, A DEDICATED GROUP OF PROFESSIONALS IN THE MATHEMATICAL, SYSTEMS AND COMPUTER PROGRAMMING DISCIPLINES TO WORK WITH YOU. TO MAKE CERTAIN YOUR SATISFACTION WITH OUR TOTAL COMPUTER SERVICE — IS TOTAL!



AVCO COMPUTER SERVICES

201 LOWELL STREET
WILMINGTON, MASSACHUSETTS 01887

251 VASSAR STREET
CAMBRIDGE, MASSACHUSETTS 02138

TELEPHONE (617) 729-7700

Trend of Affairs

The Inner Chemistry of the Outer Planets

After a hiatus of several years, interest in the atmospheres of the massive outer planets (Jupiter, Saturn, Uranus, and Neptune) has revived in the last year. Giving a seminar on the atmosphere of Jupiter in February, M.I.T.'s John S. Lewis, Assistant Professor of Chemistry and Geology, pointed out that there had been no major meeting on the subject since 1961 until this winter, when the topic was discussed at the first meeting of the American Astronomical Society's new Planetary Division and at a one-and-a-half-day symposium during the annual meeting of the American Association for the Advancement of Science in Dallas.

This revival of interest centers around the growing conviction that when we look at the outer planets—or at least, some of them—we are looking at well preserved samples of the mixture of elements from which all the planets, our own included, were formed. Reinforcement for this idea comes from Dr. Lewis's finding that the density and spectroscopy of Jupiter, as observed so far, can be accounted for by a model which consists initially of a mixture of elements in the proportions found in the sun's troposphere and in Meteorites.

The same seems to be true of Saturn. Neptune and Uranus do not fit the model—they are too dense—implying that they have not retained the proportions of the lighter elements, notably hydrogen and helium, that were originally available. But if the model fits two planets, it is a significant contribution to our understanding of the origin of the solar system as a whole.

Starting with a mix of elements such as would probably have existed in the original solar material, and taking a mass of it sufficient for Jupiter, the first problem is that its gravitational force would seemingly compress it to greater than the observed density. This snag is neatly taken care of by the heat generated by radioactive decay of the heavy elements present, which gives the model a central temperature of about 2000°K and expands it out to the observed size.

The next question is what compounds would form between these elements. Dr. Lewis has gone into this

question in great detail. An initial step is a basic thermodynamic equation relating temperature to pressure, and hence to altitude. This provides a framework against which, in the outer 200 km. of the planet, maximum altitudes for likely compounds can be fitted into place. These compounds, which generally take the form of clouds of solid or liquid particles, in turn modify the basic thermodynamics. Below 200 km., where the pressure is around 10,000 atmospheres, conditions do not lend themselves to exact analysis.

The most obvious compounds are of hydrogen with other elements: ammonia, water, and methane. The ammonia and methane have been detected spectroscopically, and thus far the model fits the observations. The water, Dr. Lewis concludes, should be in a condensed or frozen form, in which ammonia is dissolved in proportions that vary with altitude and temperature. In fact, he predicts an ice-cloud layer (like earthly cirrus) with ammonia-solution clouds above and below, this whole complex occupying a depth of the order of 50 km., and lying below Jupiter's outermost clouds.

Now, one element that is abundant in the mix is sulphur, and one might expect hydrogen sulphide to be observed spectroscopically. That it is not, Dr. Lewis accounts for on the ground that it should in fact be combined with ammonia as ammonium hydrosulphide. He has calculated that there should be a cloud of this at the 225°K level. At the A.A.A.S. meeting, an observational astronomer, F. C. Gillett of the University of California (San Diego), reported that the microwave radiation from Jupiter includes a band of black-body-type radiation seemingly coming from something at just this temperature.

This happy agreement was an unexpected bonus for a model that, in other respects, predicts nothing in the outer, observable fringes of the atmosphere that is not in fact observed. Lower down, Dr. Lewis paints an extremely alien picture. The tiny core of the planet might have a mantle of magnesium oxide and other refractory oxides. The proverbial salt of the earth appears very much higher, as clouds of halides some 50 km. below the water clouds. The silica on which we earthlings move and have our being should exist also on Jupiter, but as low-level clouds, containing various volatile silicates. The trouble, of course, with an object like Jupiter is that there are certain major difficulties in looking inside it to verify the predictions.

Mascons: Mysterious Lumps in the Moon

In the film "2001," the human race is led ever onwards in its explorations by a series of inexplicable massive objects, which materialize at critical points in history to stimulate the imaginations of men and movie critics alike. Last year, something like this actually happened. The highly perturbed orbits of Lunar Orbiter V led P. M. Muller and W. L. Sjogren to the conclusion that, on the visible side of the moon, there are six "mass concentrations," or mascons as they are now called. They seem to be in the regions of the maria, the dark, level areas, the biggest being at Mare Imbrium and having a mass of 20 millionths that of the moon itself.

This is a considerable mass, and according to one school of thought anything as heavy as a mascon should have sunk to the middle of the moon long ago, unless the moon is remarkably viscous compared with the earth. This is one problem. The main questions are the nature and origin of these anomalies. On the other hand, it may be that the mere presence of the mascons will help to remove older difficulties in our understanding of the moon. This is the view of Dr. Brian O'Leary, a Cornell University astronomer who gave a lunchtime seminar late in February at M.I.T. on his recent thinking.

Dr. O'Leary began by pointing out that current publications on mascons (of which there were a set of five in *Science*, December 20, 1968) conflict with one another, and that there is no agreement even on shape and depth: the objects might be discs, near the surface, or lumps, well below it.

The problem to which he has addressed himself is that of the moon's overall inertial asymmetry. The moon's moments of inertia about its three axes have long been known to be very different from one another. The differences are an order of magnitude more than would be expected of a body that had settled down under the influence of tidal forces until it reached hydrostatic equilibrium.

Dr. O'Leary first worked out whether the known mascons were massive enough, and rightly arranged, to account for the moments of inertia. They were in the right directions, but too light by a factor of two or three. What he has now done is to introduce, on the basis of other gravitational evidence, two more mascons on the remote side of the moon. These just about tip the scales. One of them, almost exactly in the middle of the remote face, would be about as massive as all the known mascons together. They are tentatively identified with appropriately-sized surface features.

Finally, Dr. O'Leary went further afield, and pointed out that the mascons seemed to be arranged around the moon in a spiral structure, suggesting a common origin. However, he admitted that the associated maria were estimated to be of different ages. In the face of increasing skepticism on the part of M.I.T.'s astronomers and geophysicists, he went on to propose Martian and Mer-

curian mascons, and to suggest that there might be two sorts of planetary bodies—those that could absorb mascon-sized arrivals from space (the symmetrical earth would fall into this class) and those that could not, and would preserve them.

Dr. O'Leary's contribution may not receive widespread approval, but, on the other hand, the subject is in that interesting, fact-starved stage when every theory draws forth more objections than support. The immediate future of observational mascon studies is hazy. Presumably some relevant gravity measurements will come from the orbits of the Apollo vehicles. There is also the possibility that seismometers to be placed on the lunar surface will yield acoustic transmission data that will reveal these buried masses—but that will depend on what sort of seismic activity the moon provides.

Arms Control: Dilemmas for the '70's

Two broad dilemmas confront the United States in the 1970's in its response to the strategic arms race: to "minimize the likelihood of escalation while relying on it as a deterrent;" and to minimize damage to the U.S. in the event of war without making that war itself more likely.

In the first case, says George W. Rathjens, M.I.T. Visiting Professor of Political Science, escalation to all-out war is seen as so disastrous that every effort is justified to minimize the risk. Nevertheless, in the past, U.S. nuclear strength and the possibility of escalation has deterred other superpowers from various political and military confrontations.

Reliance on escalation is, however, an extremely risky option unless the possibility of damage can be kept at a low level. With powerful new weapons systems now being planned, the time seems right to move away from dependence on nuclear weapons as a deterrent, increasing reliance on conventional strength for conventional threats.

For all these reasons, Professor Rathjens would like to

Sound Statistics Find the Lost Consonants

Most partially deaf people are insensitive to the high frequencies that characterize the "s" and "z" sounds; and conventional hearing aids are little or no help to them in this respect, merely amplifying the incoming sound throughout the spectrum.

This observation is made in an article in the Fall/Winter 1968 issue of the *Rice University Review*, by H. L. Resnikoff, (M.I.T., '57), and G. A. Sitton, who envisage a new type of hearing aid. In essence, the aid would first reduce the sound to a digital form and then carry out statistical operations on the numbers so obtained. Certain statistical functions are good indicators of particular components of speech, and in particular the very common "s" and "z" components can very readily be distinguished in this way.

The authors of the *Rice University Review* article (Dr. Resnikoff is Associate Professor of Mathematics at Rice) distinguish between some of the main methods of analyzing speech. The best known of the current techniques is probably that of making a running spectrogram of the sound, revealing the frequency-pattern of each vowel or consonant; this method generates an enormous quantity of data to describe something that, subjectively, we think of as being very simple, and many researchers are looking for more efficient ways of finding the sound-patterns that our ears recognize so easily. Another thing one can do with speech is simply to record its intensity. Vowels turn out to be louder than consonants, but beyond that little is possible in the way of sound-recognition.

But lying between these two approaches is a third. If the amplitude of the sound wave is measured at intervals of one ten-thousandth of a second, the result is a sketch of the individual waves in numerical terms—familiar to the modern communications engineer under the name of "pulse code modulation." From this series of numbers (10,000 eight-bit numbers per second) it is possible, using statistical theory and a computer, to extract a variety of measures, some of which are proving to relate closely to the properties of speech that we ordinarily recognize.

Some of Dr. Resnikoff's thinking was presented in a paper to the Acoustical Society of America in Ottawa last May. He begins by considering not the wave-forms of the speech but the times at which the wave passes through zero (which, if the wave were simple, would of course be an inverse measure of its frequency). Within a time-span of 15 ms, the intervals between successive zero-crossings are measured, and various statistical operations are done on their reciprocals (which can be thought of as a sort of "instantaneous frequency").

A statistical distribution, such as in this case the distribution of "instantaneous frequencies," can be described by a series of functions known as moments. The low-order members of this series, and ratios between them, include such familiar measures as the mean, and

see a concerted effort to negotiate with the Soviet Union before another escalating spiral in the arms race begins.

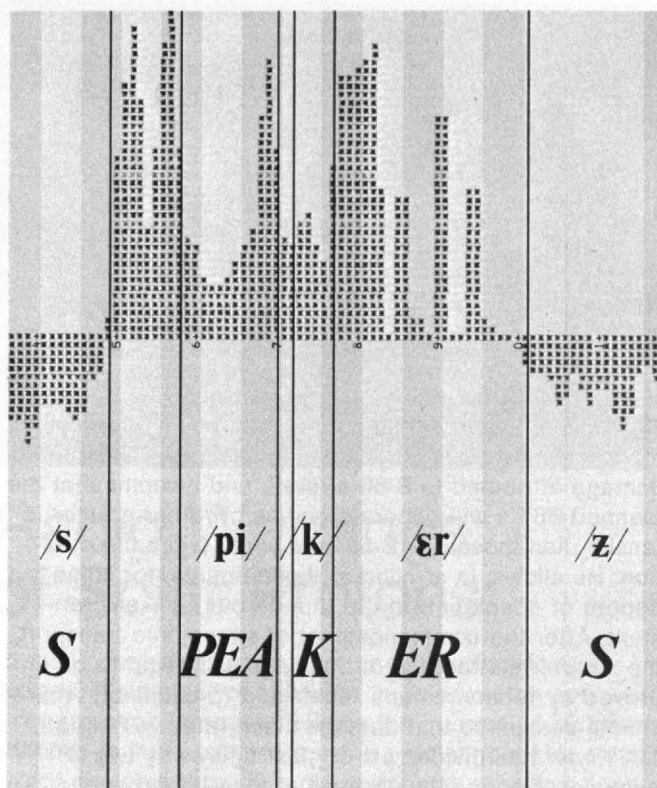
Negotiations would also help the United States to deal with the second dilemma. One of the great problems with a damage-limiting program, such as one involving anti-missiles, is that it makes a nuclear war more likely because it reduces fear. An even greater danger is that any defensive measure which limits damage encourages the adversary to compensate by creating a more powerful offensive weapon.

Probably the most serious threat to stability is this possibility of an offense-defense race, Professor Rathjens writes. And it is this threat of another spiral in the arms race upon which center America's dilemmas of the 1970's. Deployment of defensive A.B.M. systems would trigger a vastly expensive race which would lead to little improvement in security, for we know of no technology for deployment of a defense that could not be offset less expensively by new offensive improvement. Indeed, writes Professor Rathjens, offensive systems are thought to have a one- to five-fold cost-effectiveness advantage over the corresponding means of defense.

While beginning discussions between the U.S. and the Soviet Union will help in solving these dilemmas, we cannot expect too much from them even if they are successfully begun. Professor Rathjens reminds us that much of the basis for Soviet-American confrontation will still remain. "Many of the sources of tension have their origins deep in the social structures and political institutions of the two countries. Resolution of those differences will not be accomplished overnight."

Professor Rathjens sets forth his views in a comprehensive report on "The Future of the Strategic Arms Race: Options for the 1970's," prepared for the Carnegie Endowment for International Peace. Among his previous assignments, Professor Rathjens has been Special Assistant to William C. Foster, Director of the U.S. Arms Control and Disarmament Agency (see *Technology Review* for February, 1969, pp. 18-21).

Certain functions of the distribution of frequencies in speech are—like the one recorded here—sensitive indicators of particular speech elements.



the variance (roughly, width of scatter). When we reach the third-order moment, it turns out that this function is negative for "s" and "z" and positive for other sounds.

In the Rice article, Dr. Resnikoff and Mr. Sitton conclude that a machine could be made that would find these sounds and produce a low-pitched signal which the deaf person would learn to recognize as a replacement for the lost consonants. This idea is in fact one by-product of a continuing effort to apply "time series analysis" to speech.

Coal Dust Standards Reduce Lung Disease

The first federally recommended standard to reduce respirable dust levels in coal mines has been released by the recently formed Consumer Protection and Environmental Health Service of the U.S. Department of Health, Education and Welfare.

The standard was developed in an effort to reduce the incidence of soft-coal workers' pneumoconiosis or "black lung." This chronic chest disease, characterized by shortness of breath and affecting more than 100,000 miners, is caused by the accumulation of fine coal dust particles in the lungs. Setting an official respirable dust standard for bituminous coal mines will significantly reduce new cases of pneumoconiosis and decrease the rate of progression in old cases.

In setting standards the U.S. is far behind other major coal-producing nations, which all have official government standards for maximum allowable dust levels. In Great Britain these standards, set in 1949, along with the Periodic X-ray Scheme begun in 1959, have reduced the rate of pneumoconiosis from 8.1 new cases per 1,000 miners in 1955 to 1.9 new cases per 1,000 in 1967.

Foreign standards use a variety of measurement systems, some based on particle counts, some on gravimetric procedures. Recently gravimetric measurements have been accepted as more meaningful, so H.E.W. has recommended adoption of either the Mining Research Establishment (M.R.E.) horizontal elutriator or the Atomic Energy Commission (A.E.C.) cyclone. The basic interim national standard for respirable dust would be a maximum of 3.0 mg/m³ as measured by the M.R.E. instrument or 1.6 mg/m³ for the A.E.C. instrument.

Several bills which set standards are now before Congress. In March, President Nixon submitted a bill which imposes fines where dust levels are above 4.5 mg/m³ on the M.R.E. but would direct the Secretary of the Interior to lower the maximum permissible concentration to 3 mg/m³ as soon as possible. Whatever bill is eventually passed by Congress, it seems fairly certain that coal miners will soon be working in much more healthful surroundings.



Legal action; threats of legal action; concerted group action

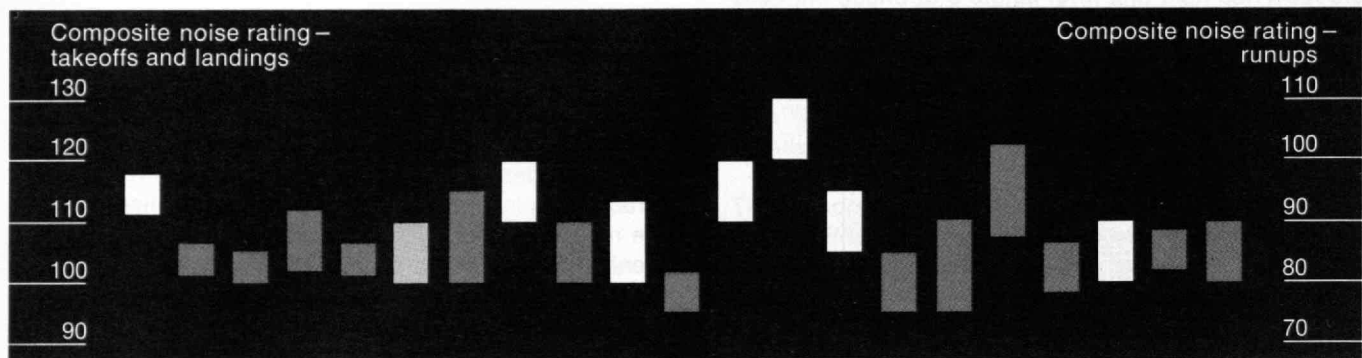


Sporadic to vigorous, widespread complaints; appeals to authorities



No observed reaction

Reactions of people in a number of communities exposed to aircraft noise environments of different "composite noise ratings." The height of each bar represents the range of ratings over a particular community. Karl D. Kryter has estimated where the SST will fall in this pattern.



Supersonics and the People Underneath

"It is concluded that the sonic booms from the Concorde and Boeing SST's operating during the daytime sometime after 1975, at frequencies presently projected for long-distance supersonic transport of passengers over the United States, will result in extensive social, political, and legal reactions against such flights at the beginning of, during, and after years of exposure to sonic booms from the flights. No data can be found to suggest that any other conclusion is possible."

The words are those of Karl D. Kryter, Director of the Sensory Sciences Research Center of Stanford Research Institute, and come from a paper published in *Science*, January 24, in which he attempts to find out what sort of noise gives rise to what sort of objections, and where the SST would fit into this general picture.

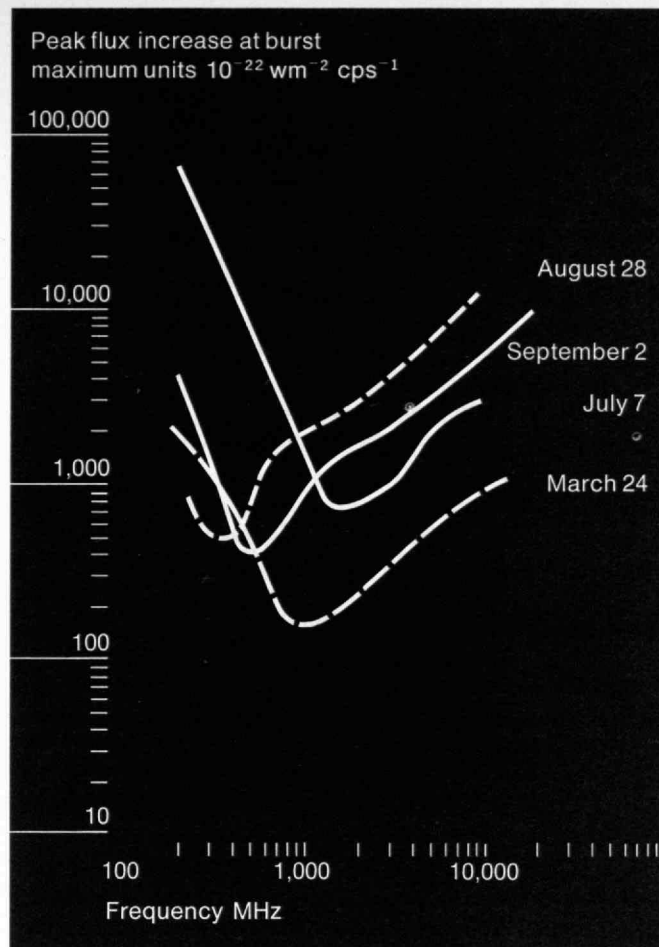
The paper brings together a variety of studies, both experimental (such as the well-known sonic boom experiment in Oklahoma City) and historical, many relating to aircraft noise other than from shock waves, some relating to other types of noise. As well as studies of the reactions of people to annoyance, Mr. Kryter reviews the available information on damage to property, and tries to predict the costs of SST booms in terms of compensation.

Taking the question of damage first, he concludes that, from 1978 on, costs would come to about \$37 million a year, if the expected number of SST's crossed the U.S. by routes chosen to avoid populated areas. If they

used Great Circle routes, the figure would be around \$85 million a year. These figures may be an underestimate, says Mr. Kryter, because he has based them on damage attributed to B-58 aircraft, and it seems that the planned SST's will generate booms of rather greater intensity than those of a B-58, and about twice the duration. He allows, in arriving at those figures, for some degree of adaptation to the thunderous new environment. After the commencement of supersonic transport, the structural strengths of buildings will begin to be improved by reinforcement, repair and (presumably) more stoical design, so that damage claim rates will fall off. Mr. Kryter has divided his original figures by two to allow for this, and thus arrived at those given above.

As to the reactions of people to noise, the general picture of public behavior is given in the diagram. The "composite noise rating" is a measure which takes in both the peak noise level and the number of occurrences of it per day. The conclusion quoted at the beginning of this note is based on Mr. Kryter's finding that, from 1978 on, tens of millions of people will be exposed to a composite noise rating of between 98 and 115, coming from between one and 51 sonic booms per day—unless, of course, there is "a drastic reduction in number or length of supersonic flights."

Mr. Kryter has cast his net very wide, and seems to have caught nearly everything that can provide food for thought about the objectionableness of the boom. Even so, he admits that his financial predictions could be out by a factor of two either way. This imprecision in current estimates of the effects of sonic-boom noise pollution makes an odd contrast with the aerodynamics and engineering that have made such pollution possible.



Radio Warnings of Solar Protons

As man penetrates space more deeply and for longer periods, the danger of exposure to solar proton and x-ray radiation increases. Hence the interest which now attaches to important progress in predicting major solar proton showers through radio astronomy reported during the winter by John P. Castelli and his colleagues in the Ionospheric Physics Laboratory of the Cambridge Air Force Research Laboratories.

Proton showers are usually—but not always—associated with the huge flares of energy which occasionally erupt from the sun. When they reach the earth, attracted by the earth's magnetic field, the high-energy protons cause a radio communications blackout from a condition known as polar cap absorption, and their ionizing potential is sufficient to be considered a modest hazard to space vehicles and their passengers.

After several years of studying radio emissions from the sun during periods of flare and proton shower activity, Mr. Castelli is convinced that proton events are associated with radio emissions of certain special frequency characteristics. And since the radio events precede by several hours the arrival of the protons in the vicinity of the earth, they serve as effective warning devices. The clue is a characteristic U-shaped radio energy distribution—high energy at the low-frequency end (200 to

The radio spectra of four proton events recorded in 1966 show the characteristic U shape described by John P. Castelli of the Air Force Cambridge Research Laboratories. Mr. Castelli believes that proton showers on earth can be predicted 5 to 14 hours in advance simply by monitoring solar radiation for radio events such as these.

500 MHz.), lower energy in the middle (about 1000 MHz.), and "fairly formidable levels" of radio energy in the 3-cm. range, up to 10,000 MHz. and higher. All proton-producing flares seem to show this clear "spectral signature." Typically, the protons begin to arrive at the earth's atmosphere about five hours after the radio emission reaches its maximum, and the proton flux peaks about 18 hours after the radio signals.

Solar radio radiation is still little understood; "there are about as many anomalies as there are straightforward events," says Mr. Castelli. But this particular correlation of frequency spectrum with proton event is now so specific that a special project has been mounted to seek a theoretical explanation.

In general, 1968 was a "good year" for proton flare research, says Mr. Castelli; there was a "rash" of proton events between June and November. But there was only one—not of major significance—in the first six weeks of 1969, he says.

Weather Technology

The interaction of technology and meteorology is a three-cornered intersection: new technological developments make possible improved meteorological services, consumers using new technological processes make new demands upon the weather services, and the weather services themselves create demands for new technology. Indeed, said Werner A. Baum, President of the University of Rhode Island, at an American Meteorological Society symposium this winter, improved technology—rather than increased understanding of atmospheric processes themselves—has made possible most of the improvement in weather services since World War II.

In general, said President Baum, there are five objectives of improved weather services: to prevent injury and loss of life from weather hazards, to prevent economic loss, to help individuals enjoy avocational activities, to help the government fulfill its obligations, and to help maintain the quality of the environment. Technological change, creating new demand, has its part in each.

Advancing technology has brought more and more people into larger and larger cities, and the problems of protecting them from weather hazards are more difficult. Farmers, for instance, can protect themselves from tornadoes because they can see the storms coming; urban residents need warning systems because their horizon of view is so much more limited. Bad weather causes more problems in urban than rural environments.

"One measure of technological progress is reduction of weather dependence," President Baum said—and he cited as examples our increasingly effective snow tires, greater dependence on greenhouses, and the Houston Astrodome. In the future, he said, weather data will be automatically incorporated into planning more and more industrial activity—especially in transportation routing and scheduling, construction programs, and farm planning.

Finally, President Baum said, technology forces us to "bring man into ecological balance with his world—to prevent him from poisoning himself and his descendants with the waste products of a technological society." A principal contribution of the meteorologist in this effort should be the gathering of data to indicate the effects of alternative courses of action. It is a "major tragedy," said President Baum, that so little has been done to develop climatological reference data; for example, he said, the U.S. has only one station for measuring carbon dioxide "which has been in existence for some years and is so located as to be independent of local pollution effects"—at Mauna Loa, Hawaii.

Controlling Evolution

The well-muscled, quick-thinking hunter no longer has the advantage in the survival of the human race. For man has introduced a new series of cultural selection devices, Dr. J. E. Rall of the National Institutes of Health told the American Association for the Advancement of Science this winter: medicine has made possible reproduction by people—diabetics, for example—who might historically have succumbed before reaching child-bearing age; legal, tax, and welfare advantages are encouraging reproduction in some social and

economic levels at the expense of others; contraceptives and sterilization are differentially available in modern society; and even such health benefits as fluoridation are changing our physical characteristics by government fiat.

Already, observed Harold P. Green, Professor of Law at George Washington University, upon hearing this list, the power of government is entering a new and very different area. Yet life scientists now forecast "a major and totally different process affecting the evolution of mankind," as man increasingly is able to manipulate his own genetic future. So the much more troubling question remains for the future: When the time comes, will government actively promote the use of genetic technology?

From his perspective as a student of government science policy, Eugene B. Skolnikoff, Professor of Political Science at M.I.T., pointed out to A.A.A.S. members that—though the life sciences appear to be offering "a major new force for the alteration of the human condition"—the situation is not in fact unprecedented. Improved transportation, health technology, better communication, more efficient agriculture—all these have affected man's condition, his value systems and his attitudes. Therapeutic uses of genetic technology, he said, simply repeat the questions of cost, control, and distribution brought as well by other forms of technological change.

But, said Professor Skolnikoff, eugenic uses of genetic technology—which offer to man the possibility of controlled evolution by the selection of psychological or physiological traits to be emphasized—bring us to "issues of a new dimension." These issues as they come to public debate will affect "man's concept of himself and of his place in the system" as deeply as did Newtonian physics two centuries ago. Clearly we must be more successful than in the past at predicting the consequences of technology, though "we have always lived with unpredicted consequences," Professor Skolnikoff noted. We must be wary of making decisions about how to deal with technology before the technology itself is understood. But can we afford to wait for the full development of genetic technology? We must try to make all technological issues understandable to laymen who must participate in the decision-making. But the issues raised by genetic manipulations are especially open to demagoguery.

The new character of genetic technology, said Professor Skolnikoff, will require that man be "remarkably imaginative and perceptive" in dealing with the conditions it will present. Yet, he added, these new conditions also suggest a simple question: Who is to say that our ability to control evolution is not a part of our evolution itself?

How Not to Change: 20 Common Hang-ups

Call them hang-ups, obsessions, bees-in-bonnets, or what-have-you, the real obstacles to progress in the fields of information and communication are not in hardware but in the mind.

Joseph C. R. Licklider, M.I.T. Professor of Electrical Engineering, who is Chairman this year of Section T (Information and Communication) of the American Association for the Advancement of Science, was riding one of his hobby horses when he made this suggestion at the A.A.A.S. meeting this winter in Dallas. He made his audience laugh so much that it wasn't at first apparent to all that he was serious. But then the facts and figures started pouring out, and they were very convincing.

To Dr. Licklider, a psychologist by earlier training, a hang-up is "a sort of mental block," a prejudice that may result from some previous experience. Often it's an emotional block in some topical area—"more emotionally toned and blocked than you would expect it to be." It may start with a person's relationship with his mother but then goes on to affect his relationship with other women, too.

When he was compiling his notes for the talk, 14 examples of common hang-ups occurred to him, he said, but he had come across six or seven more while listening to various A.A.A.S. sessions. The top of the original list was the present-day obsession with completeness. No one wants to start a project until he has all the data and all the documents available. And the cost of assembling the last few usually rises in logarithmic fashion, out of all relation to their usefulness.

The next is a mania for divorcing function from content in the classification of bibliographic material. People hung up this way, said Dr. Licklider, maintain that it isn't necessary, desirable, or practical to look inside a document in the process of bibliographic search. Then there are others who insist on the right to "browse." "If you computerize a library," they claim, "you will make it impossible to browse—and it's browsing that often leads to truly creative ideas."

Then there are those who have bees in their bonnets about computers. Some argue that computers are prohibitively expensive. Others talk gloomily about the size and cost of digital storage. "You just can't afford to accommodate in digital stores all the information that books and libraries contain," they say. They talk glibly about the cost of electrical transmission and claim that a messenger on a bicycle has "a greater band-width" than a cable.

Underlining the fact that computers can only do what they are programmed to do by people, others labor under the delusion that computers cannot deal with meanings and with natural language, that they cannot translate from one language to another or process

ideas. There are those who talk about the quality and cost of computer displays—about the flicker giving people headaches before they have read ten pages. "You can't print an entire book in capital letters," they argue, "and good computer displays are too expensive for anyone but the military—for anything except command and control."

Grumbling about the quality of computerized information, they claim that those who rely on computerized data banks will get "all the bad information, along with the good." They complain that it is almost impossible to establish uniform conventions, formats, and procedures in the computer field, because there are so many different kinds of machines, so many computer languages, that no one could possibly learn them all.

There are those who fear the implications of over-reliance on machines and ask what would happen if all libraries were computerized and we had another New England power failure, without pausing to think how much reading would be done in a black-out. If all the information in the world were stored in computers, they add, we would still need books for people to read who live in less well developed countries where this electronically-stored information would not be available or useful.

Finally, of course, there is always the well-founded assertion that large "soft-ware" systems usually fall well behind expectation and always cost more than was anticipated. The result of all this is a philosophy that urges: "Preserve the *status quo* until the new technology is proven!" This inhibits the development of new technology and further entrenches the *status quo*. It underlines the need to do much more than we are doing at present to develop and use computer technology in scientific and technical communication.

A graphic example of what Dr. Licklider was seeking to convey was the example he quoted of communications costs. A Dataphone can be hired for \$25 a month, he said. Used in conjunction with a local phone at \$10 a month, it can transmit documents at the cost of 0.7 cents per typewritten page. On a long distance circuit, such as Boston-Washington, D.C., at \$18 an hour for the line, this combination can transmit data at a rate of 1,000 pages an hour and the cost would be around 1.8 cents per page.

Compared with the messenger who carries 10 two inch-thick books at a time from Harvard to M.I.T. in an hour for a wage of around \$4,000 a year plus subway fares, for an average rate of 100 million "bits" per dollar, a TV circuit can carry ten billion bits of data per dollar—an improvement of 100 times.

As for other examples of hang-ups that Dr. Licklider noticed at the A.A.A.S. meeting, try these: the kind of person who says: "Well, that's very interesting, but you ought to take up the systems approach" . . . the person with "the government giveaway" obsession, convinced that any government program that gives away anything free will destroy the roots of the American economy . . . the "subsidies without controls" hang-up that makes people emotional . . . and those never satisfied with doing a thing only one way who believe in "the pluralistic system" and want to see everything tried two or three hundred ways—"till nothing fits together."
—Leonard Bertin

Apollo Brings the Teleconference

The conference telephone call is already established as a means of bringing together groups of people who are geographically separated. But when the Boeing Company received a contract for "technical integration and evaluation" in the Apollo program two years ago, the company realized that sound alone was not enough. The result was an audio-visual network that has joined as many as 250 men at a time, in places as far apart as Seattle, Cape Kennedy, New Orleans, Houston, and Washington, D.C. *Aviation Week* described the system in its issue of February 10.

The audio part of the network is Boeing's leased-line Blue Net. The visual part is a combination of the Xerox Corporation's long-distance xerography system, which sends photocopies by telephone, with the Bell System's Telpax A, which has a bandwidth of 48 kHz. An 11-inch information sheet, containing lettering down to 8-point type size (the smallest of the types used in this magazine) can be sent in 40 seconds. No attempt is made to transmit motion pictures of the participants, which

would be expensive—and uninformative, since most of them know each other anyway. But when a stranger is admitted to the Boeing councils his photograph can be sent out.

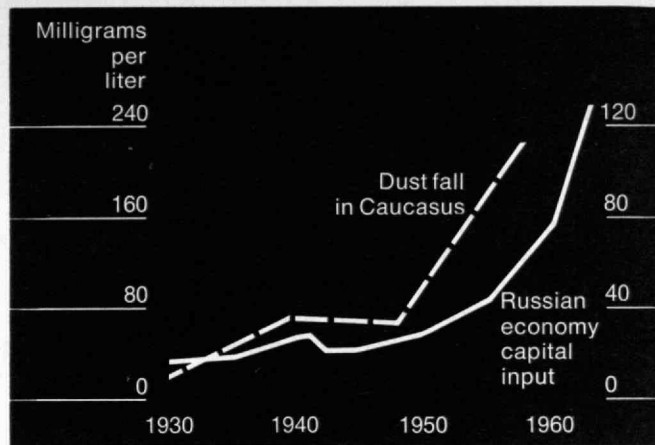
Each conference room in the network has three back-projection screens. Each participant's desk has a microphone, and local chairmen have a switch to cut their groups in or out of the conversation. The visual aids are generally prepared beforehand, which apparently imposes a useful discipline, but an unprepared picture can be gotten out through the system in two minutes. Each active participant, when the meeting is called, obtains a clear idea of what will be required of him and sets up his visual material accordingly. The combination of visual information and free discussion seems very valuable. *Aviation Week* adds that the National Aeronautics and Space Administration has its own teleconference net, and the two networks can be linked for joint meetings.

Of the possible improvements, two relate to obvious practical limitations: at present, participants have to use special teleconference rooms, since the equipment is not compact enough for a private office; the other limitation will be immediately apparent to any lecturer—there is no way of sending a pointer indication.

A Dusty, Cold Climate

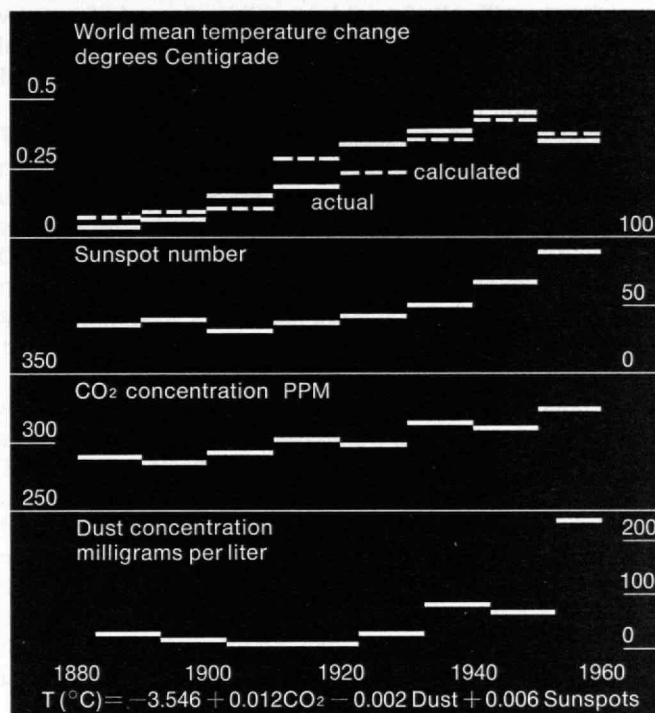
What is happening to the world's climate? (If you think the last ice age is still receding—the mountains, glaciers, and ice caps growing smaller, the winters growing milder—you are wrong.) What has man to do with it? (Surely something, at least on a regional scale; but there may be more people at work devising new flavors and packages for bubble gum than are now studying man's effect on his earth's climate.)

Climatologists have for years suggested correlating the increasing amounts of carbon dioxide in the atmosphere with a gradually warming climate. The burning of fossil fuel now releases some 15 billion tons of CO₂ into the atmosphere annually, according to Francis S. Johnson of the Southwest Center for Advanced Studies in a report to the 1968 meeting of the American



Dust is rapidly increasing in the atmosphere above the Northern Hemisphere, says Reid A. Bryson, Professor of Meteorology at the University of Wisconsin, and he attributes to it a recent reversal in long-term climatic trends. Some of these dust concentrations seem to correlate with agricultural activities, others (above, right) with rapid industrial development.

"Population growth, mechanization, and industrialization have now made man the equivalent of other natural processes in his effect on climate," Professor Bryson told the American Association for the Advancement of Science this winter. The marked increase in atmospheric dust since the 1930's has now reversed the trend of warming world climate induced by the gradually increasing CO₂ concentration in the atmosphere. And, he says, since the industrial revolution is still underway in large parts of the world, "there is little that any one nation can do to reverse the trend."



resulting from agricultural burning, and some is brown haze from suspended mineral material—at least in part the result of the removal of natural cover by overgrazing of domestic animals. There are no "systematic" observations and no plans for any. But Dr. Bryson reported studies of dustfall on the high snowfields of the Caucasus which indicated little variation from 1790 to 1930, then "a catastrophic rise of 19-fold" to 1963. The number of "smoky" days in Chicago rose from about 20 per year before 1930 to a high of 320 in 1948.

The local effect of dust is to provide condensation nuclei to increase fog and rainfall and decrease temperatures. The regional effect is to reflect heat from the sun back into the upper atmosphere and space, also decreasing ground temperatures. Using the figures from the Caucasus, Dr. Bryson told the A.A.A.S. he believes that since 1930 the increase of dust has "dominated and more than negated the increase of carbon dioxide, terminating the warming and producing a decline of world temperature."

There is also the probability, said Dr. Bryson, that increased local turbidity will affect the atmospheric circulation pattern to weaken the prevailing westerlies. Such weakening, he said, "has been characteristic of the 1960's, and this change of gradient can have profound climatic effect."

Association for the Advancement of Science, and the atmosphere's CO₂ content has increased about 10 per cent since 1900. The earth's delicate carbon dioxide balance is changing.

The familiar "greenhouse" theory of solar absorption suggests that this change would cause the climate to become slowly warmer. But now there is a rapidly increasing new influence—atmospheric turbidity—postulated to offset this effect, and the result is "a rapid downward trend of temperature," Reid A. Bryson, Professor of Meteorology at the University of Wisconsin, told members of the A.A.A.S. this winter.

"Large sections of the world," he said, "are characterized by at least high seasonal levels of dust and smoke which are general in distribution." And though most studies have shown a "rapid increase" in the period since the 1930's, until now "little attention has been paid to the climatic effect of these millions of square miles of 'dust cloud' cover," Dr. Bryson said.

The dust cover occurs over much of Africa, Arabia, Southern Asia, China, and Brazil; some is blue haze,

... and a Sterile Sea

The changes man makes in his planet's atmosphere may appear very quickly (see above), but what can take a few years in the atmosphere can take millenia in the ocean—to reverse, as well as to accomplish.

The process of modification is beginning. "Man, a land organism, is influencing the chemical composition of sea water more than any of the species that live within the marine environment," said Edward D. Goldberg, Professor of Chemistry at Scripps Institution of Oceanography, at the 1968 meeting of the American Association for the Advancement of Science in Dallas this winter. For example, he said, some 3,000 tons of mercury reach the oceans of the world each year from natural continental sources and 4,000 tons from

Some Have Dullness Thrust Upon Them

"The kids in Scarsdale are more disadvantaged than the kids in Harlem," stated Harvey Pressman, Associate Director of the Regional Educational Laboratory of New England, part of the Education Development Center, during a discussion with the M.I.T. Matrons in February. "Generally speaking, Harlem kids are more interested, more independent thinkers, and more realistic than their suburban counterparts who have grown up isolated from the problems of the world."

What is needed are revolutions in urban education to develop the talents of these children, instead of the present system which stultifies their growth.

In the talk and discussion Mr. Pressman outlined the revolutions which are necessary in the next few years in order to make urban education in America a worthwhile institution. No one revolution can solve the problems of the urban schools, but many revolutions are urgently needed to alleviate the present urban education crisis.

First on Mr. Pressman's list of necessary revolutions is a complete change in staffing patterns. "Teachers are the central problem of urban education. They don't know how to deal with the kids." Pre-professionals—persons without formal training but with an intimate knowledge of urban problems and local conditions—can bring impressive talent, often previously suppressed, to the schools. Many programs have begun whereby pre-professionals can gain credit towards formal degrees while they are working. In addition, an entirely new kind of person is needed to teach in urban schools; the socially motivated liberal arts graduate should replace the usually conservative education-school graduate.

Along with a revolution in teachers, there must be a revolution in what is taught. Current materials emphasizing the Horatio Alger view of America are totally irrele-

fungicides and industrial processes; the lead input to the oceans from automobile fuel is "roughly equivalent" to that from sedimentary action; carbon-containing substances generated by man's activity are at least as important as those generated by photosynthesis in ocean-growing plants; pesticides, "a recent and novel entry to the marine environment," now are widespread, and so are radioactive species; and man has introduced two totally new elements to the oceanic environment: sewage outfalls and accidental pollutions from man's commerce, of which one of the largest has been the immense volume of petroleum in the *Torrey Canyon* disaster of 1967. Perhaps half of all these contaminants are introduced into the world ocean by activities in the U.S.—as compared with the rest of the world—said Dr. Goldberg.

The general effect of all this is little known, and Dr. Goldberg believes "an understanding of the consequences of man's chemical invasion of the oceans" is now of "crucial import." An exception is the *Torrey Canyon* disaster, whose consequences were so specific and so relatively local as to be intensively researched. As a result it is clear, the A.A.A.S. was told by J. Eric Smith of the Plymouth Laboratory of Britain's Marine Biological Association, that "the deleterious effects of the oil were minimal" for marine life (excluding birds) but that the detergents with which Britons attempted to disperse the plague made the intertidal communities of the shore "a scene of progressive devastation" and caused the death of many animals—crabs, shrimps, and bivalves—in the near-shore shallows.

But algae had returned to Britain's southern shores by the summer of 1967, and present research on the ecological successions suggests that "full recovery is expected within one or perhaps two years," Dr. Smith said. In the end the most important lesson of the *Torrey Canyon*, he declared, is that "the key to understanding the conditions of development of a marine pollution and the assessment of its consequences lies in the hands of the scientist. We have it in our power," said Dr. Smith, "to measure the onset and progressive development of the many kinds of acute and insidiously growing manifestations of pollution to which we are becoming increasingly exposed and which we ought not, without good reason, be prepared to tolerate."



Coming Shortly: The Space Merchants

If the costs of transporting material through space continue to fall as they have done during the last five years, another decade or so should bring them to a level where the commercial carriage of certain valuable commodities becomes economically feasible, Ernst A. Steinhoff, Visiting Professor at M.I.T., said at a seminar held in January by the Department of Aeronautics and Astronautics. The lunar grand tour could well fit the pockets of some affluent pleasure-seekers already living today. From a more businesslike point of view, the importing of extraterrestrial merchandise might become worthwhile.

This dramatic reduction in freight charges—around two orders of magnitude from early cost estimates for Apollo—assumes a number of developments: nuclear propulsion from near-earth orbit onward, increasing reusability of space-ship structures, and the manufacture of fuel from raw materials available on the moon. A great deal depends on how easy it is to set up a largely self-supporting station on the moon, and Dr. Steinhoff's paper on "Exploitation of Extra-Terrestrial Resources" was largely devoted to this question.

By weight, 90 per cent of the moon-station's needs would be water. Like the children of Israel in that other wilderness, the lunar pioneers could probably get their water from the rocks. Dr. Steinhoff showed estimates of how much energy this would need, starting from rocks with various water contents (between one and ten per cent is perhaps not too much to hope for).

Oxygen is there in plenty, according to the Surveyor results, along with a few percent of aluminum and iron (or, at any rate, elements of similar atomic weight to iron), plus a great deal of silicon, as in earthly granite. Further, the reported gaseous emissions give promise of, if not actual pneumatic bliss, perhaps usable amounts of hydrogen and methane.

Extra-terrestrial resources include not only the raw materials for fuel, food, and construction, but also certain environmental conditions which are difficult to achieve here below: low or zero gravity, extremely high vacuum, and certain radiation spectra, for instance. "Old man Torricelli didn't know what he was saying when he announced there was such a thing as a vacuum," said Dr. Steinhoff. Much better control of impurities in solid state electronics components—which, of course, have a high value-to-weight ratio anyway—could be one competitive reason for working in space. And, as regards low-gravity processes, a number of workers have been looking at this field and have come up with such materials as foamed steel and titanium (weighing, say, four pounds a cubic foot) which would actually be cheaper to make extraterrestrially than at home. Early this year, the Marshall Space Flight Center published the papers of a conference on "Manufacturing Technology Unique to Zero Gravity Environment."

vant and phony to children of the ghetto. They must learn about their own communities and environment first.

Teachers must make use of all media, not just the printed word, to interest the children. Mr. Pressman documented this with a film "Classrooms in Transition," which showed underprivileged children in Washington, D.C., schools using many Elementary Science Study materials with great delight. He also displayed high-school projects, such as the E.S.I. Negro Unit, which are being used successfully.

A redefinition of the goals of urban education is necessary before a complete, new curriculum can be devised. The cultural clash between teachers and students must be alleviated. Consciously or unconsciously, teachers feel that underprivileged children are inferior; experiments have shown that children achieve poorly when little is expected of them. "The schools make dullards out of children," said Mr. Pressman. Reading achievements drop below normal only after children have been in school for four or five years.

Among other revolutions mentioned, a revolution in the decision-making process is most urgent. According to Mr. Pressman, the community and the teachers should be working together to gain power from the administrations and school boards where it now lies. The New York example is atypical and has been a bad influence on other cities. Together teachers and communities could work to dilute the power of the other groups and share the decision-making process with no faction overwhelming the others.

Washington, D.C., school children are engrossed in learning basic science through materials developed by the Elementary Science Study, part of the Educational Development Center in Newton, Mass. Children learn much more successfully when they are actively involved in an experiment instead of just reading about it.

WHY SHOULD YOU HIRE A PERSONAL INVESTMENT MANAGER? —WEALTHY PEOPLE DO!

Because it pays! Experience has taught the wealthy the advantages of hiring professionals to manage their money. The wealthy discovered long ago that it takes special training, long experience and intangible special skills to manage money successfully. Your money is just as important to you, if not more so, than it is to the person of wealth. For you to give such a valuable, hard-earned asset less than expert care is very risky and too often quite unprofitable.



**JOHN KENNEY
ASSOCIATES, INC.**

The advantages of joining John Kenney Associates, Inc.

Our program is designed **exclusively** to help people of moderate wealth preserve and build capital. To achieve this goal, we bring to bear on your capital the same advantages which, until now, have been available primarily to the wealthy. Successful investing is a difficult undertaking because the majority view is usually wrong. But, to uncover and analyze what is really going on is not easy. We simply believe we have many advantages and our chances of success probably greater than yours.

Our success is a direct result of your success

Think about this carefully! It is the heart of our concept and extremely important to consider. **Our sole objective is to improve your financial position through carefully selected common stocks.** We have **no** securities to sell. We **do not** sell subscriptions to any financial publication. Our success depends on how well we do for you—**and nothing else!**

Right now is the best time to inquire about an investment program that many of the top people in the financial community feel is the wave of the future. An excellent answer for millions of investors who recognize the great value of investing their savings in the future of our country—yet all too often lose out by unknowingly “playing the stock market.”

Take a moment to inquire further about John Kenney Associates and how it can be the answer you have been looking for?



Yes, please send me additional information describing your program and your progress.

John Kenney Associates, Inc.
Prudential Tower—Suite 4418
Boston, Massachusetts 02199
(617)536-7100

Name _____

Street _____

City _____

State _____

Science and the Magico-Mythical

At the time of writing, the Al Capp strip shows Abner attempting, by bringing education to Dogpatch, to dissuade the children from their belief in witches. His efforts are frustrated by the tangible successes of the local witch. Mr. Capp's implication that reason does not triumph automatically is supported by recent work at the University of Ghana, reported in *Nature*, December 20, 1968.

Gustave Jahoda, of the University of Strathclyde, Scotland, finds that university education—even in science subjects—has little effect on the supernatural beliefs of Ghanaians. He gave a questionnaire to 280 male students at Ghana University, including in it “ten questions dealing with supernatural beliefs which are widespread among the population at large.” He does not give all his results in detail, but offers as an example the response to the question whether witchcraft exists as a power. Forty-one per cent thought this probable, and another 35 per cent were certain of it. Only 14 per cent were sure it did not.

The students who had been at the university longer were no less credulous than the freshmen. Science students and arts students were likewise indistinguishable. Those taking social studies had fewer traditional beliefs than either the scientists or the arts men—which, Jahoda suggests, may be related to why they chose this field of study. Jahoda also tested intelligence, and found it quite unrelated to degree of belief.

Jahoda concludes that if “a magico-mythical world view is an obstacle to the emergence of creative scientists,” and if university training does nothing to diminish these beliefs, “then more direct methods of reducing them may have to be explored.” He does not specify what these methods might be.

The idea that a scientific education rapidly frees the mind from its burden of superstition goes back at least as far as Lucretius. It is apparently only now being exploded—in spite of the fact that the most creative scientists of former times believed, in general, what their contemporaries believed, and many of them have left extramural writings that fill the (entirely rational) modern researcher with scorn, pity, and amusement.

SUMMER GUIDANCE & STUDY INSTITUTE

JULY 1—AUGUST 17

Unique, individualized Vocational and Educational Career Plan determines realistic goals for boys in Grades 7-12. Accredited college-prep courses in English, 3 languages, sciences, math, history. Professional staff of educators. Classes limited to 5. Driver education. Broad cultural program. Swimming, golf, tennis, riding and other recreational opportunities in White Mountains vacation area. Inclusive fee covers everything.

Director: **JOHN H. FLYNN**
Tel: Fryeburg, Me. 207-935-3105

FRYEBURG ACADEMY

FRYEBURG

MAINE

Engineering and Science at IBM

"The interdisciplinary environment keeps you technologically hot."

"Working in data processing today pretty much means you work in a broad spectrum of technologies," says Nick Donofrio.

An Associate Engineer at IBM, Nick is a 1967 graduate in Electrical Engineering. He's using his technical background to design circuits for computer memory systems.

"Circuit design used to be a narrow job," he says. "Today it can take you into the frontyard of half a dozen different fields. In my job, for example, I consult with systems design engineers, chemists, physicists, metallurgists, and programmers."

Keeping up

The interdisciplinary environment at IBM helps an engineer or scientist keep up to date technologically. As Nick puts it, "You're constantly exposed to what's happening in other fields."

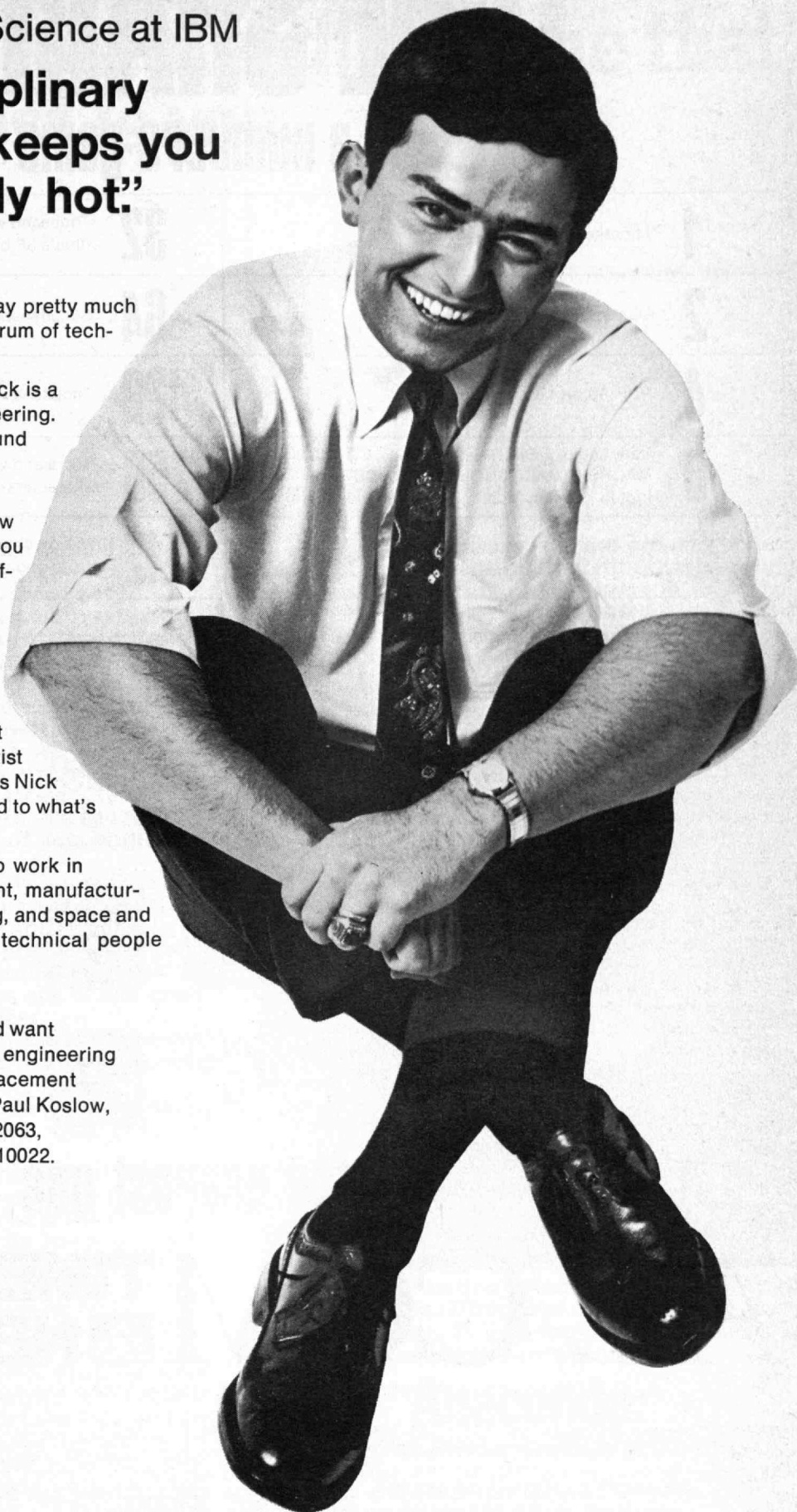
IBM needs technical graduates to work in research, design and development, manufacturing, product test, field engineering, and space and defense projects. We also need technical people in programming and marketing.

How to get more information

If you're getting a degree soon and want more information about careers in engineering and science at IBM, check your placement office. Graduates should write to Paul Koslow, IBM Corporation, Department CD2063, 425 Park Avenue, New York, N. Y. 10022.

An Equal Opportunity Employer

IBM®



TIME SHARING

...is a numbers game

1 Microsecond memory cycle time	32 Thousand words of core memory per user (that's 36 bit words)
2 Dual AL-10 Systems	64 Simultaneous users
4 PDP-10 processors	128 Thousand words of core per system
8 Languages: FORTRAN IV, BASIC, COBOL, MACRO-10, AID, SNOBOL, LISP, DDT (not to mention SEDIT, COGO-10 and others)	256 Thousand words per user file (1.25 million characters)
16 Offices around the U.S.A. More to come.	512 Million characters of on-line storage (disc and drum)



Call the nearest one...

AL/COM TIME SHARING NETWORK

AL/COM is a service of Applied Logic Corporation, 1 Palmer Square, Princeton, New Jersey 08540

BOSTON Computer Dynamics, Inc. (617) 523-3636; **CLEVELAND** KPA Time Sharing, Inc. (412) 462-7515; **BUFFALO-ROCHESTER-TORONTO** Computer Task Group, Inc. (716) 634-9090; **HARTFORD** Information Systems Corporation (203) 522-0665; **NEW YORK CITY AREA** Computer Solutions, Inc. (212) 349-1531 and (201) 678-6300, Davis Computer Systems, Inc. (212) 867-6406, Directed Research, Inc. (212) 586-6660, Computer Task Group, Inc. (212) 757-9035; **PHILADELPHIA-CAMDEN** Information Management Corp. (609) 665-6088; **PITTSBURGH** John Keane Associates (412) 372-6226; **PRINCETON** Applied Logic Corporation (609) 924-7800; **SAN FRANCISCO** Basic Computing Arts, Inc. (415) 964-3138.

Of all the natural resources Anaconda works with, the one that counts most is you.

By the year 2000 A.D. the world's population will have doubled. For every two Americans now, there will be one more. A growth of 50%.

And that's just a little over 30 years away. This is the problem we're facing at Anaconda.

How to provide the millions more tons of copper, aluminum, and other non-ferrous metals that will be needed to provide essential needs.

Metals for building, electrical power systems, and agricultural systems. Metals for new and better transportation, new and better roads, and communication. Metals necessary to change sea water to fresh. To help underdeveloped nations develop. Plus, a whole myriad of possibilities we haven't even dreamed of yet.

The needs are obviously immediate and urgent. And Anaconda is growing and diversifying here at home, in Latin America and Canada. In as many ways as we know how to provide these basic building blocks on which our economy grows. In ways we like to think make us one of the great natural resources of the Americas.

But metals alone don't make the company that mines and fabricates them a great natural resource.

What does it is people. And the skill, imagination, and determination they bring to their work.

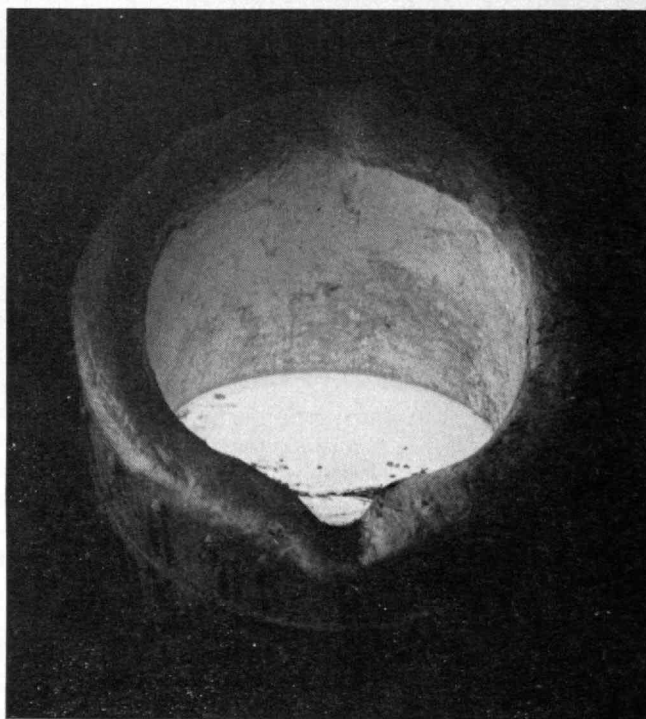
Without these qualities, metal lies hidden, useless. And can never reach the potential necessary if we are to answer these problems at all.

That is why Anaconda has a commitment. To back the creative energies of our human resources with our faith in the future, and our money, to meet the growing needs for metals.

In the last 10 years we invested \$750,000,000 for new plants and equipment. There will be another \$650,000,000 in 1968-1972. Plus, we have research on a global scale. A whole new western exploration headquarters in Salt Lake City, and an extractive metallurgical research laboratory in Tucson. Staffed with specialized scientists, geophysicists, metallurgists, mining engineers and other highly trained individuals. This is the kind of backing we give to our people.

And the people we need are numerous. Teams of earth scientists, metallurgists, mining engineers. Fabricating, marketing and financial specialists. All the sort of dedicated people that know their work is vital and important.

Anaconda. Come make a future with us.



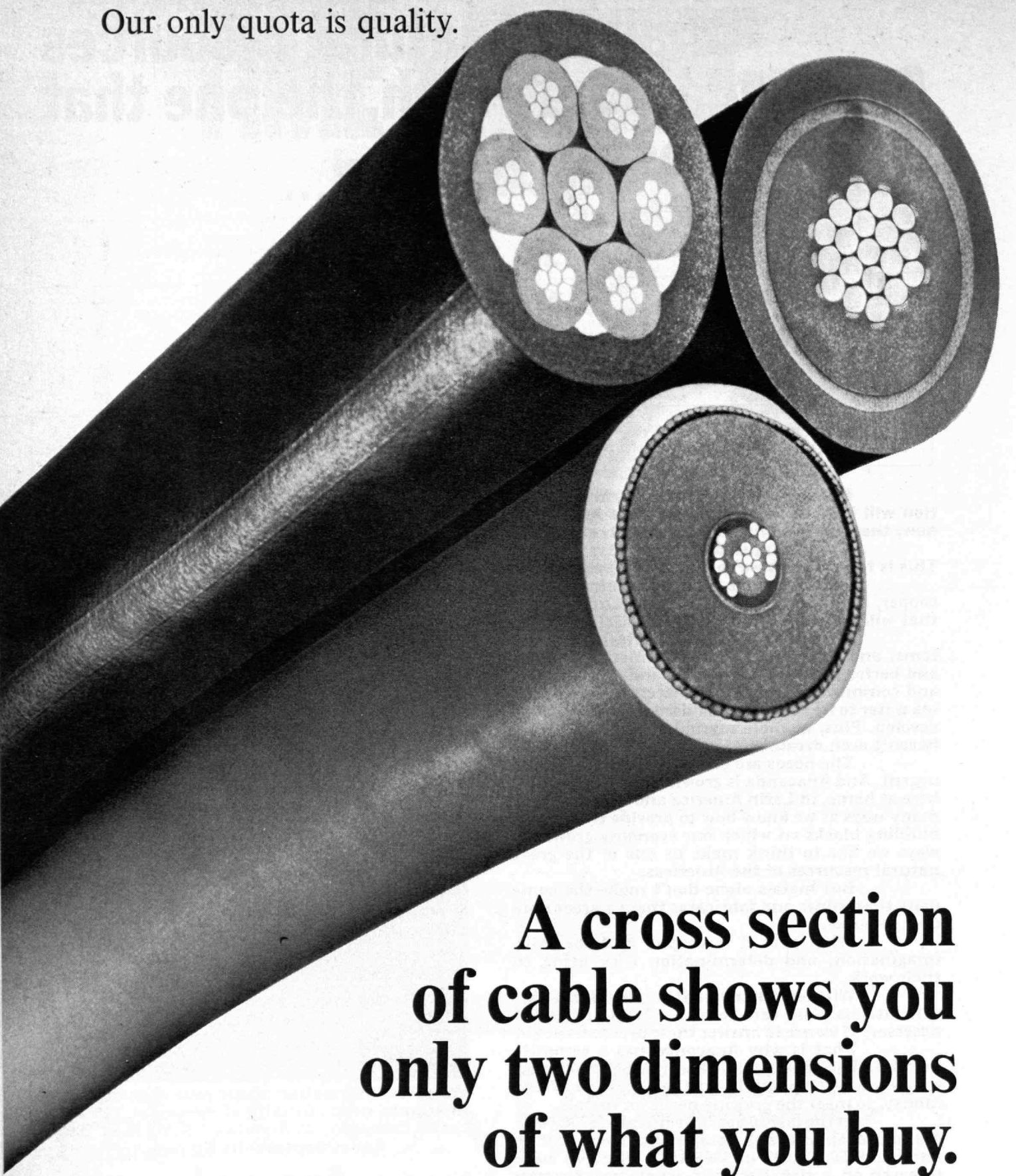
For more information about your opportunity at Anaconda, write: Director of Personnel, The Anaconda Company, 25 Broadway, N.Y., N.Y. 10004. Equal Opportunity Employer.

Anaconda:
one of the great natural resources of the Americas.

Anaconda American Brass Co.
Anaconda Aluminum Co.
Anaconda Wire & Cable Co.

68120

Our only quota is quality.



A cross section of cable shows you only two dimensions of what you buy.

The third dimension of a cable, which is its consistency of quality, must be known before you can appraise its performance. The quality of a cable is no greater than the strength of its weakest point. Kerite cable also gives you the fourth dimension of time.

The Kerite Company • Principal Offices: New York, Chicago, Seymour, Connecticut • Sales Representation Throughout the United States.

MEMBER
RPI **Kerite** 
the cable that lasts...and lasts...and lasts...

Puerto Rico: A New Forum For Social Technology

Luis A. Ferré, a prominent M.I.T. alumnus who has just been elected Governor of Puerto Rico under the banner of the New Progressive Party, has called upon his alma mater for help in dealing with his island's complex problems. M.I.T. has agreed; and in responding the Institute anticipates for itself as well as for Puerto Rico a new kind of experience in applied social technology.

M.I.T.'s plans to help Puerto Rico will include the Center for International Studies, the Department of Civil Engineering, and the Sloan School of Management. Mason Haire, Professor of Management, will represent the Sloan School's involvement, and Chandler H. Stevens, a former Massachusetts State Representative who holds a Ph.D. in Economics from M.I.T. (see *Technology Review for March, 1969, p. 67*) will act as full-time liaison man for the program. Over \$100,000 in Puerto Rican government funds have been tagged for the project, and matching funds are being sought from foundations. Governor Ferré's request is timely, says Professor Haire, because Puerto Rico is at a turning point. Tax incentives granted during recent years have resulted in thriving industry, growing work force, and surging economy. But this industrial momentum has brought problems—a lagging agricultural economy, urban slums, social problems, and demands for better education.

Dr. Stevens' first efforts will be in public management, to provide better administrative programs within the government and more effective communication with the people. He also wants better communications with Washington, "to see if available funds are reaching the agencies that most need them." And he will study recruiting, training, and compensation for government employees "to ensure a continuing supply of executive talent for the middle and top administrative levels."

Other parts of the program include studies of government decision-making systems, fiscal policies, economic strategy, human resources, and environmental development. In all of these activities, the program will draw on faculty and students of M.I.T. and other institutions. It will also review the programs of state government reorganization now under way in Massachusetts and California.

Governor Ferré has centered Puerto Rican participation in a non-partisan Advisory Commission on the Development of Government Programs, which will establish task forces on major problem areas. This commission-task force concept, says Professor Haire, should have applicability elsewhere, in other countries and perhaps in institutions from which the task force members will come. Indeed, he says, "certain colleges and universities may find this effort interesting enough to involve their students as well as faculty."

While he works for Puerto Rico, Dr. Stevens will also be undertaking for M.I.T. a comprehensive study of the opportunities and hazards inherent in interaction between a university and a political entity, and he will also be accumulating experience to support that study. The Sloan School's heavy emphasis on innovation in management practice and quantitative approaches to social problems clearly qualifies it for a major role, says Professor Haire, but he hastens to add that "dealing with social technology poses a different set of problems from dealing with hardware technology.

"But if we can succeed in this Puerto Rican venture," Professor Haire believes, "M.I.T. may well have established a good—and possibly unique—working model for how academic social technology can relate effectively to the outside world."

Beranek:



Leo L. Beranek

From Sound to Sight

In what may turn out to be a landmark decision, the Federal Communications Commission early this year gave the right to own and operate an established Boston television channel to a new team of freshman broadcasters.

After the longest hearings in its history, the F.C.C. denied the renewal application of WHDH, Inc., a subsidiary of the Herald Traveler Corporation, to operate the station on Channel 5 and accepted the application of Boston Broadcasters, Inc. The decision is still subject to appeal, but if and when B.B.I. does begin broadcasting on Boston's Channel 5, its President, Leo L. Beranek, has big plans.

Dr. Beranek, a one-time M.I.T. faculty member (now Lecturer in the Department of Electrical Engineering) who is President of the acoustical engineering firm of Bolt, Beranek and Newman, wants to replace some of the "violent" network shows with "good" shows of local origin which will have been tested before Boston's considerable night-owl population before going on B.B.I.'s prime time.

Dr. Beranek emphasizes that television should meet the unique needs of young people. "The young people who are now 21 years old have grown up with television. They're used to seeing the most crucial world events moments after they actually happen. The assassination of Senator Kennedy is an example. So when they turn to public affairs immediacy becomes very important, and they are frustrated by the slowness with which governments and institutions act.

"With local television, the community and its problems can achieve this immediacy and interest. It can play a very important role," says Dr. Beranek.

He listed from memory all the subjects he would like to see on commercial television—religion, education, dramatic arts, medicine, the problems of greater Boston, historical documentaries. "Once in a while, now, a high school class is allowed to watch a lung operation at the Massachusetts General Hospital. Why shouldn't all students be able to see this—how cancer has damaged a lung—on television?"

How would this differ from educational television? "Educational television doesn't have to compete for advertising. They don't have to make their programs attract viewers. We will. This will be our incentive to produce lively, interesting material."

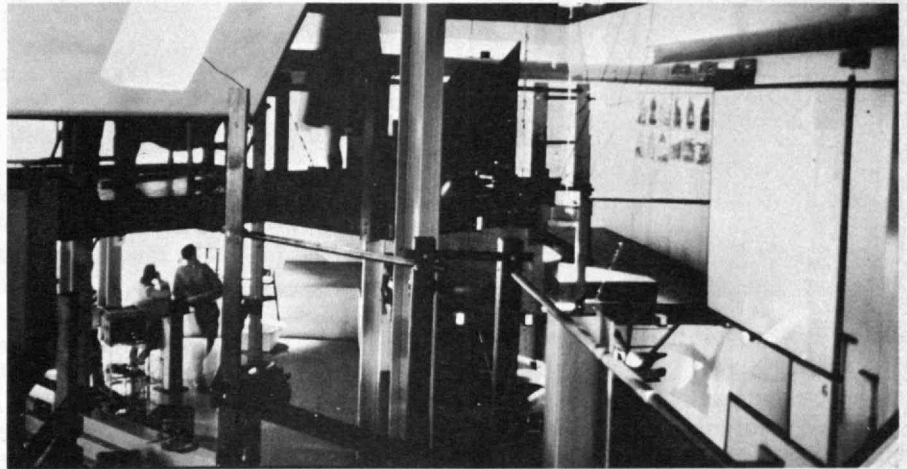
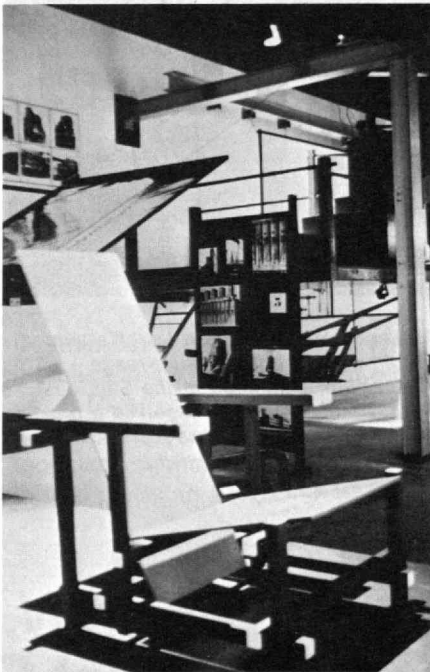
Can you make money with this kind of television? "We estimate our profits will be half of what WHDH, Inc., makes now." And, said Dr. Beranek, half of B.B.I.'s profits will be plowed back into the operation.

Two features of B.B.I.'s plans swung the F.C.C. decision in their favor, Dr.

Beranek thinks. One is that B.B.I.'s 30 owners are all prominent Bostonians—local residents—who are not involved in the control of other media. The other is that six of the 30 will be involved in the station full time, and the F.C.C. hopes that this integration of management and ownership will lead to better programming.

"It is healthy," wrote F.C.C. Commissioner Nicholas Johnson of the Channel 5 decision, "to have at least one station in the major markets that is truly locally owned and managed independently of other major local mass media. It is a step, however small, back toward the Commission's often-professed but seldom-evidenced belief in the benefits of local ownership and media diversity.

"It is, at the very least, an interesting experiment which will be watched carefully by many," said Commissioner Johnson.



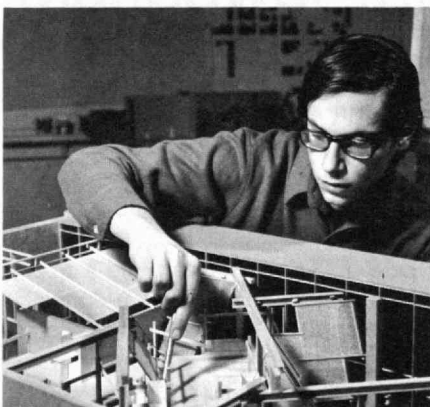
Form and Use in Architecture

Although "Form and Use in Architecture" is not a title designed to wave flags and rally troops, Stanford Anderson, Assistant Professor of Architecture, and his ten seminar students see their Hayden Gallery exhibit—of the same name—as radical and new. Instead of investigating buildings, they have made an inquiry into the basis of architecture, the interrelationships between forms and their uses.

The exhibit carefully avoided buildings; instead it relied on tools, furniture, and other artifacts—and lots of slides—to illustrate the point, as explained by Professor Anderson: "The built environment presents in material form an unusually insistent exchange between the intellectual realm of form/idea/model and the empirical realm of fact/circumstance."

The slides illustrated the main problem—that objects are immobile but uses change. An example was a series of double slides of coastal towns seen from the sea, showing the continuous interaction between changing uses (the boats coming and going) and the stable forms of docks and wharves. Only one house was shown: the Schröder house built in Utrecht in 1924 at the outset of the Bauhaus movement—an example of a designer's conscious effort to formalize different human uses of space.

The exhibit's designers followed through the adaptation theme by soliciting additional display material even after the exhibit opened. Similarly, they arranged for a two-day seminar at the close of the exhibit at which guest speakers discussed the form-use idea. Some student theses may also result. "Form and Use" may thus become an ongoing M.I.T. project.



The interaction between forms and their uses was expressed in a winter exhibit created during a seminar in the Architecture Department and shown in the top right and top left photographs. Above, one of the student designers, William Schweber, displays a model of the exhibit, which the students designed and built themselves.

The Floating Particle Problem, etc., on Apollo Excursion to the Moon

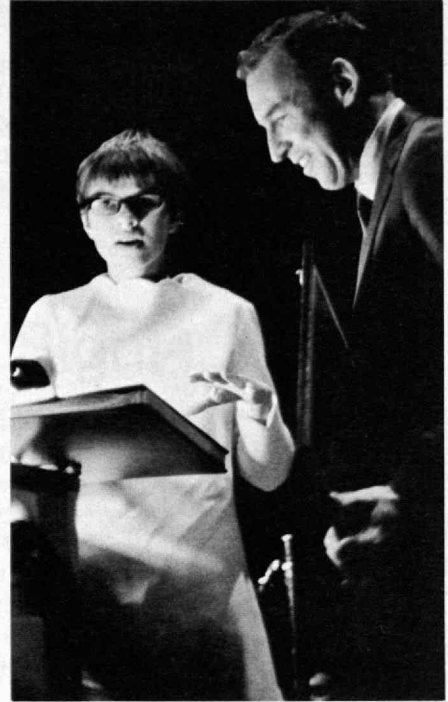


Seven weeks after his return from the moon, Captain James Lovell came to Cambridge to visit the Instrumentation Laboratory where the Apollo craft's guidance and navigation equipment was developed. The afternoon ended with an appearance at the Kresge Auditorium, for the benefit of students and staff of M.I.T. There were other speakers—President Howard W. Johnson, Charles S. Draper, Founder and Director of the Instrumentation Laboratory; David Hoag, who leads the Laboratory's guidance and navigation work, and Christopher C. Craft, N.A.S.A.'s Director of Flight Operations. But the star was Captain Lovell.

Nevertheless, the show had clearly been conceived as a whole. Dr. Draper (who had been introduced with a tribute to his work in "the guidance and navigation of the young people who have worked and studied with him") told us that technology—the adaptation of the environment to suit *us*—was such that "there is no way you can stop it . . . it feeds upon itself" and then lightened the mood by comparing himself to Peter Pan. Mr. Hoag's description of the control problem provided Captain Lovell with a good entrance line, to the effect that if he'd known it was so complicated he wouldn't have gone. Mr. Craft built up the tension, describing the atmosphere at Houston during the "trans-earth" homeward burn ("most of us were praying"). And then, to a burst of applause lasting over a half a minute, the astronaut climbed on to the stage from a seat in the auditorium, where he had earlier dispensed autographs to an eager mob of students (who, however, were less fortunate than the girls of M.I.T.'s McCormick Hall who had entertained him with home-made cookies).

Between Ourselves and Explanation

Captain Lovell greeted the audience as "fellow students" (another reference to Mr. Hoag's talk). He paid tribute to the 200,000 people who had worked for the Apollo 8 flight and to the 200 million taxpayers who supported it (laughter). He said that in his post-flight travels he had been greeted by many happy faces of people who were really waving and applauding themselves. He told the story of how he had once been recognized by a taxi-driver, who had proceeded to hold forth on how an astronaut's life was not for him—far too dangerous—while crossing two traffic streams against the lights. And



The requests for Captain Lovell's autograph, which began in the Kresge Auditorium, continued in the Sala de Puerto Rico, where he received a presentation by the Undergraduate Association President, Maria Kivisild.

with the rather embarrassing line, "Tighten up your seatbelts and listen to the countdown"—his only lapse from naturalness—Captain Lovell showed his film of the flight.

It was an extremely polished performance—a stirring tale of adventure leavened by a series of jests, not one of which failed. Captain Lovell was glad that he did not have to land in the Sea of Fertility, because he already had four children. His commentary on a bit of zero-gravity knockabout with a couple of flashlights was worthy of the silent-film narrators of an earlier generation. Frank Borman—who seems to be the Ringo of the outfit—was the subject of a variety of laughs: his comic anxiety at trans-earth injection; his seasickness; his cleanshavenness.

Even more popular than the comedy was the serious message at the end of the film. Against a backdrop consisting of a total view of our planet, Captain Lovell reflected that it had taken him two minutes to pass through the atmosphere, that this margin between ourselves and extinction was thus only two minutes wide, and that we should be careful not to damage it. This was not only true, but also so well put that even working photographers could be seen lowering their equipment to join in the clapping.

After another half minute of applause, the spaceman answered questions from the audience. Some of them were technical, relating to the difference between new craters and old ones, the nature of the rays, and so on, and Lovell showed himself to be a talented expositor. Some were more personal: Why did he not shave during the trip? Well, although there were various inventions to overcome the floating-particle problem, he'd as soon leave it grow. The applause as he bowed out lasted well over half a minute, and was of the quality that one associates with encores.

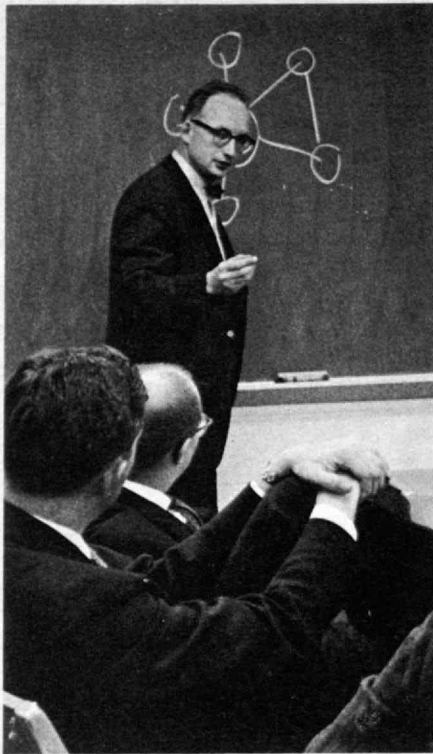
Captain Lovell has the rare ability of pleasing old and young, square and hip alike. If asked to comment on political questions such as science funding under Nixon, he holds his peace. He is entertaining, instructive, inspiring, and seemingly spontaneous. He is for the Bible and against pollution. He antagonizes no man. If the two major parties are not bidding for his services they are missing a trick.—F.W.

Wood: Manpower for the Cities

The Joint Center for Urban Studies, now 10 years old, has a new director, its first from M.I.T. and its first to arrive directly from Washington after holding national responsibilities on urban problems. These circumstances, plus the growing sense of urgency about the cities felt by many researchers in the field, have suggested to some observers that the Center may take some new directions.

Its new director is Robert C. Wood, Head of the M.I.T. Department of Political Science (see *Technology Review* for March, 1969, p. 84) and former Under Secretary and—briefly—Secretary of the Department of Housing and Urban Development. Since he made the Washington-Cambridge move last January, Professor Wood's time has been largely consumed by his departmental responsibilities. So his conversation with *Technology Review* centered on the Center's role in terms of the national priorities he faced while at H.U.D.

"There is a new environment for urban research now," says Professor Wood. "We have passed the stage of debate on whether there is an urban problem, although there are some people who still don't believe it. We have also passed the stage of believing that a few, isolated scholars looking down from their academic towers are sufficient to cope with it. Current constraints are as much a lack of knowledge as they are a lack of money and manpower."



Robert C. Wood

Professor Wood said that one alternative future for the Center would be to help produce trained urban management and research manpower for the next generation. "Most of the people who now run cities entered public life in the 1930's and are now retiring. The cities face a tremendous manpower shortage. Harvard and M.I.T. graduates flood the Peace Corps with applications, yet few of them apply, say, to be Water Works Commissioner for the City of Boston."

Shortly after he arrived in Cambridge, Professor Wood told a Harvard-M.I.T. audience that a main need now is for comprehensive and highly professional education in the urban field. "We must be equipped to cope with the next crisis, rather than the last one. Compassion and competence must come together. Compassion alone does no good at all."

As to how the university should meet actual urban problems, Professor Wood said what appears to be a basic theme: "Particular projects for particular missions do not work in an urban environment. There must be pluralism, a generality of inquiry, and a broad perspective."

The University and the City

A Harvard faculty committee has added significant new weight to the arguments that an urban university has special responsibilities to its environment.

Harvard University, said the Committee on the University and the City in its report to President Nathan M. Pusey this winter, has traditionally followed a policy of "minimal impact." But times are changing, and members of the committee called on Harvard to understand that the "minimal impact" policy leads the university to miss "a lot of opportunities to anticipate problems in the community and correct them."

The Committee agreed that Harvard must not be diverted from its basic purposes as a "center of learning and free inquiry." But Harvard also has obligations of institutional citizenship, which the Committee took pains to detail. It should help increase the supply and decrease the cost of housing, help students from the local community to obtain Harvard admission—"especially those lacking encouragement to pursue college studies"—help disadvantaged local residents to find university jobs, and listen to community welfare needs.

Accepting the report, President Pusey noted that "the University is not alone in its effect and cannot proceed alone.

"What is needed," he wrote, "is a community-wide reassessment by all the Cambridge and Boston educational institutions, the financial and industrial enterprises and the city governments, cooperating with men and women of good will from among the general public, to determine the appropriate goals and then work to effect the environmental changes which all of us know are needed."

Door-to-Door Transportation

The Department of Housing and Urban Development has given M.I.T. a \$28,500 grant for study of a door-to-door transportation system using computers from scheduling and routing transit vehicles. Daniel Roos (M.I.T., '61), Director of M.I.T.'s Civil Engineering Systems Laboratory, will direct the work.

investechTM

precisely what is it?

precisely those common stocks believed to be most undervalued among the hundreds we regularly monitor.

precisely selected with the aid of computer techniques using data supplied by our security analysts.

precisely employed in a portfolio management strategy designed to keep money optimally at work in undervalued stocks.

precisely oriented toward capital gains investing . . . toward the search for capital growth through eventual realization of fundamental values.

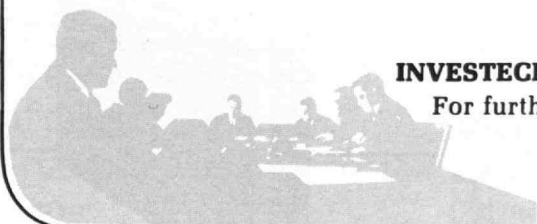
INVESTECH is a service of the investment management affiliates of:

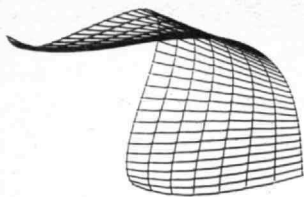
THE BOSTON COMPANY, INC.

100 Franklin Street
Boston, Massachusetts 02106
Telephone: (617) 542-9450

INVESTECH is intended for fundings of \$240,000 or more.

For further information please direct your inquiry to
Department T2





At **Adage** you can be your own architect and design a position for yourself in a revolutionary technology. The problems of 2001 A.D. can be solved today by computer graphics.

Computer systems engineers, scientific programmers, systems analysts, and logic designers are invited to participate in modern applications of this dynamic science.

For further information,
please write or call collect
Mr. Michael Brazis (617) 783-1100.

Adage
INC

1079 Commonwealth Avenue
Boston, Massachusetts

An Equal Opportunity Employer

LAIRD EXECUTIVE MANAGEMENT INCORPORATED

Counsel to
Industry and Investors
In Identifying, Appraising, and Selecting
Entrepreneurs and Professional Managers

Suite 3920 • 280 Park Avenue • New York, N.Y. 10017

Science/ Engineering Alumni Magazines

Advertisers can reach
the alumni of 32 major
universities with a high
percentage of science and
engineering graduates
at discounted rates

For details write:
American Alumni Magazines
50 East 42nd Street
New York, New York
10017



Heat-transfer coils have been our *one* — our *only* business for over 45 years. Designing and engineering coils into today's sophisticated comfort conditioning systems calls for a lot of coil capability.

Aerofin objectively evaluates every vital collateral factor: stainless steel, copper, aluminum tube construction — single or multiple rows — surface and circuitry selection — fin-spacing efficiencies — preheat or reheat applications — fluid fouling tendencies — freeze-up hazards — space-saving considerations — and header designs for banking in stacks or connecting to duct work.

Whether it's hundreds of coils for job-site system-assembly or a single replacement — Aerofin gives you *maximum performance*. Get customized coil climate control help from Aerofin's national network of sales specialists.

**The tougher
the application...**

the more the specs fit AEROFIN

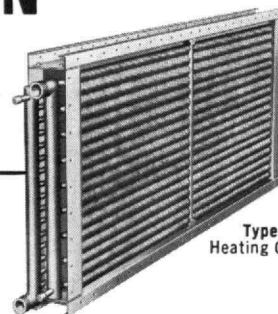
AEROFIN CORPORATION

Lynchburg, Virginia 24505

Aerofin is sold only by manufacturers of fan system apparatus. List on request.

AEROFIN OFFICES: Atlanta • Boston • Chicago • Cleveland • Dallas • New York • Philadelphia • San Francisco

Aerofin Corporation Ltd., Gananoque, Ontario — Offices: Toronto • Montreal



Type CH
Heating Coil

Weather or Not?

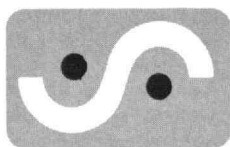
THAT IS THE
QUESTION!

Most businesses are weather-sensitive: utilities, banking, agriculture, construction, retailing, manufacture of seasonal products, resort and hotel management, to name a few. Deviations from the usual patterns of weather can affect them considerably . . . in purchasing, scheduling, inventory control, distribution, operations . . . in the P & L, where it counts.

Now a unique service presenting a 6 month advance notice of weather factors can be utilized in conjunction with other correlated parameters to provide more effective business intelligence for decision making and planning. The cost-benefit ratio is outstanding.

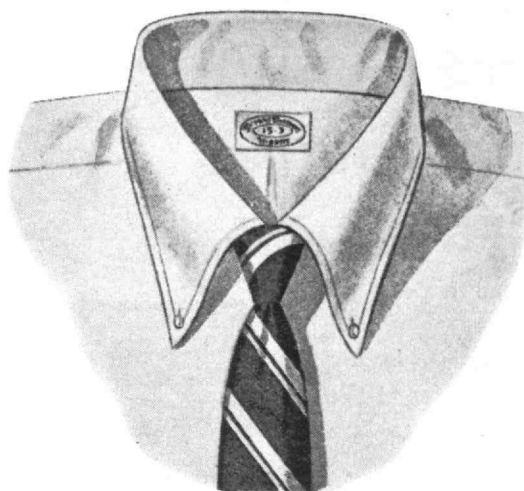
The credentials and experience of our organization are formidable. Techniques and methods have been evolved from research done at M.I.T. for the U.S. Air Force and the U.S. Weather Bureau.

Write now for a brochure describing our service and how it can benefit your business.



Statistical
Weather
Information INC.

Box 9088 • Boston, Mass. 02114



an ideal shirt for travelling...

OUR OWN MAKE BROOKSWEAVE OXFORD of Dacron polyester and cotton blend

We—after extensive cooperation with DuPont—first introduced the now-famous “washable, little or no ironing required” shirt. Constantly improved to make it lighter and longer-wearing . . . we have recently further improved both weave and finish. The results, we are sure you will agree, make Brookswave one of the finest shirts of its kind available today.

*Brookswave Oxford Shirts with Button-Down
Collar in White, \$9.50; Blue, \$10;
Blue, Tan or Grey Stripes, \$10*

Sizes 14-32 to 17 1/2-36. Mail orders invited.

ESTABLISHED 1818

Brooks Brothers
CLOTHING

Mens & Boys' Furnishings, Hats & Shoes

346 MADISON AVE., COR. 44TH ST., NEW YORK, N.Y. 10017

46 NEWBURY, COR. BERKELEY, BOSTON, MASS. 02116

ATLANTA • CHICAGO • LOS ANGELES • PITTSBURGH • SAN FRANCISCO • WASHINGTON

Strobe Probe

SENIOR PHYSICIST

New England based company, for 3 decades a leader in the field of infrared detection systems for industrial, military and space applications has need for a Senior Physicist to undertake broad technical responsibility in the application engineering, physical measurements and reliability of complex miniaturized infrared sensitive semiconductor components.

The candidate should have at least 10 years experience in the foregoing or related fields. A degree in Physics or Electrical Engineering is required with graduate work in this area highly desirable.

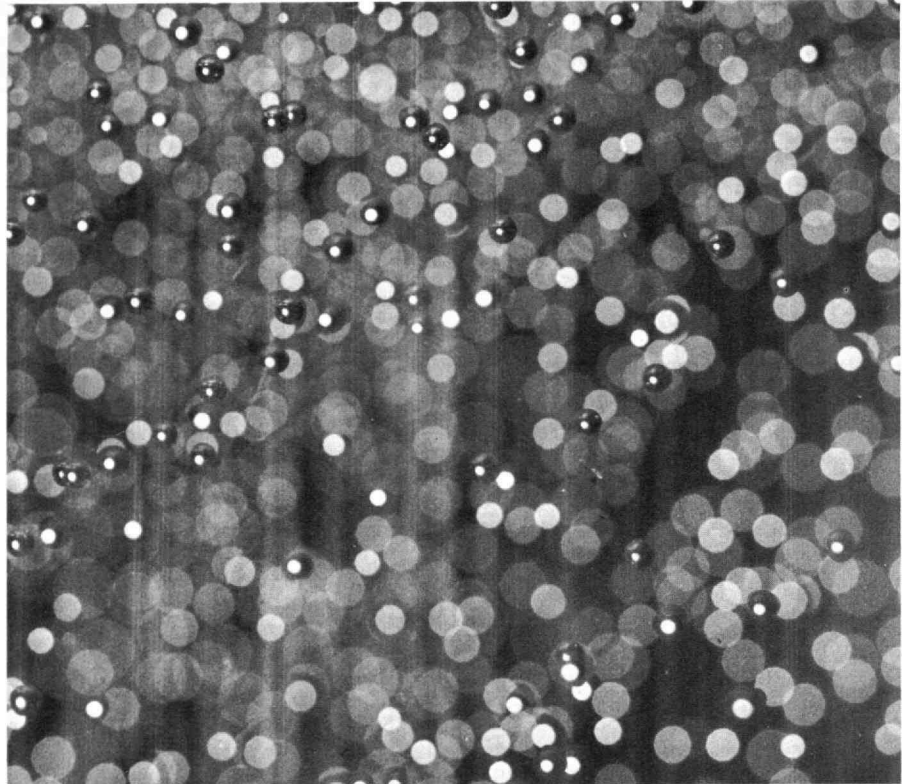
Applicant must have drive and demonstrated qualifications of leadership and will work closely with top technical management. This is a career position offering an unusual opportunity in an ever expanding field.

Please send resume
with full details to:

**Technology Review
M.I.T. E-19 Room 430**

**P. O. Box 71
Cambridge, Mass. 02139**

An Equal Opportunity Employer



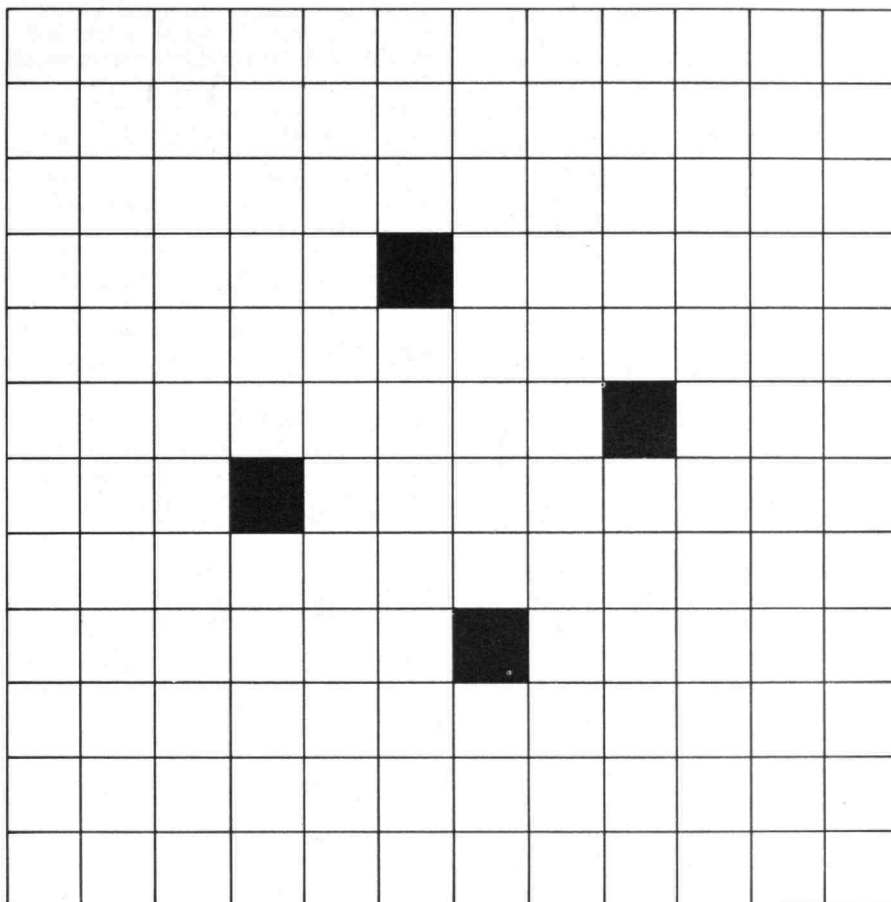
What is it?

(See the answer on page 103.)

Dr. Edgerton, a pioneer in the technology and art of high-speed photography, is Institute Professor Emeritus in the M.I.T. Department of Electrical Engineering.

Techno- logical Crossword

John M. Sandor



This puzzle incorporates two problems, not necessarily dependent upon each other. As you can see, only four squares of the pattern have been blacked out, indicating that it is four-ways symmetrical, and none of the squares has been numbered. Using the information given below with each clue—that is, its number and its length in letters—and/or obtaining the solutions to the clues, it is possible to construct the pattern of the crossword. Then the blanks can be filled in the normal way.

It is to be emphasized that the blacked-out squares have strictly tetragonal symmetry about the center of the pattern, and that to work out the pattern it is *not* necessary to have solved any of the clues, though this naturally speeds up the solution time!

A dictionary should not be required.

Tech-Croctic, March

The correct solution to the Tech-Croctic on page 74 of *Technology Review* for March is below.

"THE PRIMARY ECONOMIC AND POLITICAL CONDITION WHICH CONTROLS ALL USEFUL DISCUSSION OF PRICE STABILITY IS THE OVER-RIDING IMPORTANCE OF HIGH EMPLOYMENT. THE OPPORTUNITY FOR A JOB AND THE INCOME THAT GOES WITH IT DOMINATES OUR THINKING ON ECONOMIC POLICY."—J. K. Galbraith, *The Liberal Hour*.

Clues across:

2. What, undo a class reunion? Outrageous! (10)
5. White as a chicken . . . (5)
7. Soapy mineral found in an unusual crystal configuration. (4)
10. Who is upset by this question? In what way? (3)
11. This sounds direct and uncomplicated, but its meaning is restricted and narrow. (6)
13. Thing that goes wild in the dark hours? (5)
15. This pertains to ice cream and mathematics . . . (5)
16. Shove around in back and scourge! (6)
18. Pressure is involved in writing this letter. (3)
19. It is perhaps done in a place that remains undisturbed. (4)
21. About two hundred fly through the air . . . (5)
22. Transportation turbulently enters it at the first border. (10)

Clues down:

1. The revolutionary hero, the president, the city, and the state—all of them bear it! (10)
2. The playwright and critic must run the wash through again! (4)
3. He gives a direction in the middle of an entrance. (5)
4. Allow for an obstruction? (3)
6. Hurry up and reorganize, as then you will work this out!! (6)
8. He gets Ann to rewrite his name. (5)
9. His fur is useful when it becomes cold in an oriental country. (10)
12. Fasten firmly to a twisted arch with no attachment! (6)
14. Yawned while being confusedly paged. (5)
17. People of South America who used to rule their country. (5)
18. Walk in peace . . . (4)
20. As before used to be? (3)

Mr. Sandor, a graduate of the University of Cambridge, is studying for his doctorate in the M.I.T. Department of Metallurgy.

Puzzle Corner

Allan J. Gottlieb

The weather here has been very dull lately—no sunshine. Just cloudy, bleak days. With such dull surroundings, I don't feel very creative. My first attempt at an introduction for this column, an extensive account of the miserable weather, now sits in the garbage pail where it belongs. My style is so poor today that I will dispense with any further opening remarks in favor of getting right to the problems.

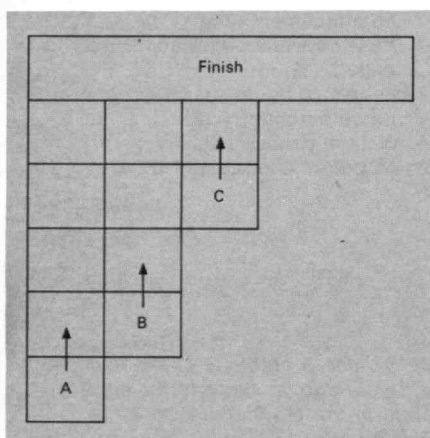
Problems

26 Frank Rubin would like you to find the smallest integers m and n such that $m - n^3$, m , and $m + n^3$ are all perfect squares.

27 Smith D. Turner writes a long explanation which in the end includes an "off-track betting" scheme:

"For betting purposes, a horse race is sometimes simulated by having a number of woolen horses run a course of several moves, the one to move each time being determined by lot. For example, use six horses, throw a die, and the first whose number is thrown (say) 10 times wins. To make this more interesting, I have set it up where one horse must move only a few times, and others increasingly more, to win—thus creating a 'favorite' and 'long shots' in the betting—say 2, 3, 5, 6, 8, and 10 moves with six horses.

"I have found it extremely difficult to calculate the probabilities for such a set-up.



Even with a much simplified race—e.g., three horses having to move 5, 4, and 2 times (below, left)—the calculation was very laborious. In the case illustrated, I get the probability of the favorite C to win as 15001/19683.

"Could anybody check this and—more importantly—come up with a method, computer or otherwise, of handling a more complicated race, say the 2, 3, 5, 6, 8, 10 above?"

The next two problems come from two of my colleagues from M.I.T. student days in Baker House—Andrew Egendorf and George Starkshall. They write:

"In the most recent issue of the *Chinese Journal of Ichthyological Nutrition* we came across the following problem: Give the next number in the series 77, 49, 36, 18, _____. Of course, the answer is trivial. Each number in the series is obtained by multiplying the digits of the preceding number. Thus the next term is 8. This series is unique in that among such series in which the initial term is a two-digit number, it is the only one which contains five terms (before reducing to one digit on the last term). All other such series have at most four terms. The problems:

28 "It is required to show that this series is, indeed, unique (other than by enumerating every series).

29 "Furthermore, given an n -digit number, consider the series formed by multiplying all the digits of that number together, continuing in the same manner as the above series. What is the maximum number of terms in such a series and how many different series will there be with exactly m terms?"

D. Thomas Terwilliger has submitted the following particularly cool problem:

30 "A mathematician moonlighting as a census-taker stops at his friend's house. In this census he is required to obtain the names and ages of all the occupants of the house. After writing down several names and ages the census-taker asks, 'Are there any more people who live here?' His friend replies, 'Yes, there are three more people that live here.' When

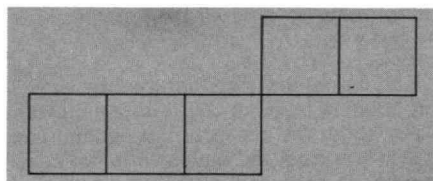
asked for their ages, the friend reports that the product of the ages is 1296 and the sum is the street number of his house. The census taker makes a few calculations and then says, 'Just tell me one more thing: How many of the three are older than you are?' As soon as his friend replies, the census taker smiles, writes down the ages and leaves. What is the house number?"

Here is a very unusual chess problem from Douglas J. Hoylman, who attributes it to the University of Oklahoma Mathematics Department through his friend Joe Kelley:

31 The diagram below shows the final position in a chess game in which White has checkmated Black. What was White's last move? (And while you're at it, what was his next-to-last move?)

Black							
						WK	
					WP	BK	
					WP	BP	
						WP	
WP							
	WB						
White							

SD12 Russell A. Nahigian wants you to move two matchsticks and change the figure below into a figure consisting of four equal squares.



SD13 Mr. Nahigian also contributes the second speed problem. He writes:

"Three missionaries and three cannibals come to a river. They find a two-man boat, but the missionaries only have time to teach one cannibal how to paddle before the monsoon flood reaches them. All three missionaries can paddle. The missionaries know the cannibals will attack and overcome the missionaries any time when there are more cannibals than missionaries present. Being sagacious, they solve the problem of getting across the river without ever allowing outnumbered missionaries on either shore. How?"

Solutions

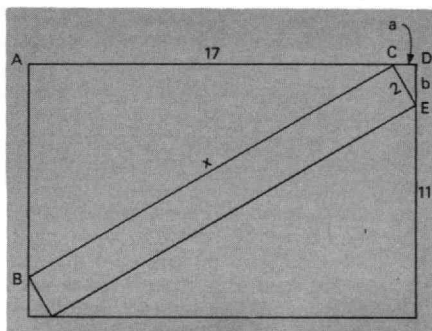
11 Find the range of positive values of x such that, given x , the only positive value of y which satisfies $y^x = x^y$ is the trivial solution $y = x$. For those values of x for which nontrivial solutions for y exist (e.g., $x = 2, y = 4$), how many solutions are there for a given x ? If a value of x is selected at random from the open interval $(0, e)$, what is the probability that a nontrivial solution for y lies in the same interval?

The following is from Mr. Rubin: We take the (xy) -th root of both sides to get $x^{1/x} = y^{1/y}$. Consider $f(x) = x^{1/x} = e^{(\log x)/x}$. This is a function which increases from 0 at $x = 0$ and 1 at $x = 1$ to a maximum at $x = e$ and decreases monotonically to 1 as $x \rightarrow \infty$ (since $(\log x)/x \rightarrow 0$). Thus only the trivial solution exists for $0 < x \leq 1$, exactly one nontrivial solution exists for $x > 1$, and whenever $1 < x < e$ we have $y > e$, so no nontrivial solutions exist with both x and y in $(0, e)$.

Also solved by Mr. Turner, Mr. Hoylman, and the proposer, John E. Prussing.

12 Given a two-foot-wide carpet laid so that all four corners touch the four walls of a room 17 by 11 feet, find the length of the carpet.

Burton Rothleder submits the following:



Triangles ABC and CDE are clearly similar. Labeling the unknown hypotenuse x and unknown sides of CDE a and b , similar triangles yield

$$\begin{aligned} (11 - b)/a &= (17 - a)/b = x/2. \\ \text{Also, } a^2 + b^2 &= 4 \text{ from triangle CDE.} \\ \text{Then} \\ 11b - b^2 &= 17a - a^2 \\ b^2 &= 4 - a^2 \\ b &= (4 - a^2)^{1/2}. \end{aligned}$$

Substituting for b and b^2 ,
 $11(4 - a^2)^{1/2} = -2a^2 + 17a + 4$
 This is a fourth-degree equation which is time-consuming to solve. The drawing was made to scale and shows $a \sim 1, b \sim 1.75$. Using a Wang desk calculator to solve for a and b by trial and error, it only took a few minutes to determine that $a \approx 1.0027$ and $b \approx 1.7305$. Thus, $x \approx 18.4891$.

Also solved by Donald C. Dickson, Mark Yu, William R. Osgood, Richard Joos, and Messrs. Turner, Prussing, and Rubin.

13 Set up all 32 chessmen on the board so that each one has at least six legal moves—except pawns, of course. Bishops belonging to each player must be on different colors. One king may be in check but not both. Pawns may be placed in the first rank but not in the eighth rank.

Everyone found solutions satisfying additional conditions as well. The nicest was by the proposer, Steven Scott, who increases the requirement to seven legal moves from six:

Black							
				WB	BQ	WR	BP
WP		WK		WB			WP
BP	BP			WKt			BR
WP			WP	WKt	WP		
BP			BP	BKt	BP		
WP	WP			BKt			WR
BP		BK		BB			BP
				BB	WQ	BR	WP

White

14 Let $n_1 = x^x, n_2 = n_1^x, \dots$

$n_i = X^{n(i-1)} = X^{x^{i-1}}$
 and let $N = \lim n_i$ as i grows large beyond bound. Do real values of x exist for all positive N ? If so, what is the relationship? If not, what are the limitations?

Several people noted that the problem was stated incorrectly (corrected above) and even figured out the correct question. But only Messrs. Yu and Rubin could solve it. Here is Mr. Yu's solution:

Since $R\{n_i\}$ is a monotonically increasing sequence for all positive $x \neq 1$, it suffices to prove $N < \infty$ in order to assure that $\lim n_i$ converges in R^1 . Surely

if $x > 1, N = \infty$. Otherwise, suppose $x < 1$ so $x = e^{-p}$ (some $p > 0$). By repeated application of the inequality $e^{-y} < 1/(1+y)$ we have:
 $n_i < f(p, i)/[f(p, i) + p] \leq 1$,
 where f is a polynomial whose degree is $(i-2)$ (where $i > 2$) and $f > 1$ (this

says $n_i > 1/(1+p)$). This means that $N = x^N$, or $\log x = (\log N)/N < 0$, since $x < 1$. Hence $N < 1$. The solution to the problem then is that x can be found so that $n_i \rightarrow N$ if $D < N \leq 1$ (for $x = 1, N = 1$).

15 This is a logical set of numbers, mathematically derived: 10, 11, 12, 13, 14, 15, 16, 17, 20, 22, 24, 31, 100, ____, 10,000. What is the missing number?

Elliot D. Friedman submits the following "honest" solution:
 Since the sequence of numbers is the base ten number 16 expressed in bases ten through two, then the missing number is 121, expressing base ten 16 in base 3. But Mr. Friedman also writes, "I won't claim to be so smart that I worked that one out. The problem appeared at least five years ago in advertisements of Litton Industries. If you aren't aware of that particular source of problems, Litton publishes usually yearly and distributes at the I.E.E.E. show in March booklets called 'Problematical Recreations.' Copies are available from Litton on request."

An amazing letter came from the family of Juan Maran:

"I have been arguing with my wife over the answer to your problem. We both recognize, of course, that the series represents the first 15 most significant (non-one-digit) integers—i.e., 10 = first composite which is unit backwards; 11 = first prime which is itself backwards; 12 = first composite which is composite backwards; 13 = first prime which is larger prime backwards; 14 = first composite which is prime backwards; 15 = first composite whose digit sum is composite; 16 = first square which is prime backwards; 17 = first prime whose digit difference is composite; 20 = first composite which is lesser prime backwards; 22 = first composite which is itself backwards; 24 = first number which read forward or backward is divisible by the same composite; 31 = first prime which is smaller prime backward; and 100 = first square which is unit backward. (10,000, of course, is fascinating—being the first integer that requires a comma.) The missing number, I say, is 121, that being the first square which is itself backwards. I am reinforced by the

observation that the squares (base ten) of the first three nonunits (base two) are 100, 121, and 10,000. My wife says the missing number is 1729, being the first totally uninteresting number and hence quite distinguished. Our son agrees with me about 121, but as he thinks the next number is 1,111,111,111,111,111, I scoff.

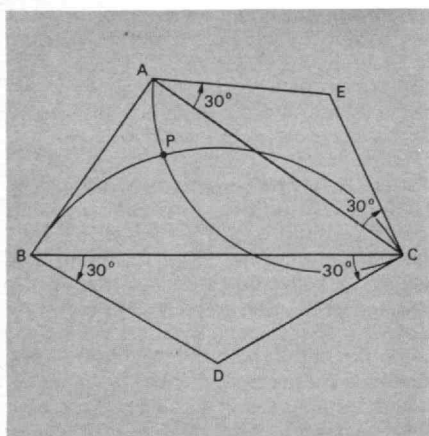
Also solved by Messrs. Hoylman, Yu, Rubin, and Joos and by Thomas Jabine, Charles Russell, F. W. Hawkes, and Thomas Nelson.

Better Late Than Never

Returning to problem 1, published in the October/November, 1968, issue of the *Review*, the following improvement is credited to Russell L. Mallett.

1 Given an arbitrary triangle, find (by geometrical construction) the point such that the sum of the distances to the three vertices is a minimum.

Mr. Mallett writes: "The solution you published for this problem (see *Technology Review for February, page 73*) was not a geometric 'construction' at all, since it used limiting processes (impractical ones, at that). My solution was a simple ruler-and-compass construction: Let A, B, and C be the vertices of an arbitrary triangle with largest angle α at A. If $\alpha \geq 120^\circ$, then the desired point P coincides with A. If $\alpha < 120^\circ$, then P is determined as the intersection of two circular arcs with easily constructed centers D and E as shown.



Although I used a bit of calculus in my original proof, purely geometric arguments can be used to show:

1. P cannot lie outside the triangle.
 2. If P lies on the triangle, then $\alpha \geq 120^\circ$ and P coincides with A.
 3. If P lies inside the triangle, then AP, BP, and CP make equal angles (120°) with each other and $\alpha < 120^\circ$.
- These lead to the given solution.

Mr. Rubin solved 2, 6, and 10. And someone finally solved 4—Frank Rubin, of course!

4 Consider a sequential gambling system on sequences of Heads and Tails in which the bet at each stage may depend only on the outcomes of the previous events. The gambler has an initial capital w and may never bet more than he currently has. Given capital a after k trials, the gambler may bet any amount b , $0 \leq b \leq a$, on either Heads or Tails, and the gambler's fortune at the next stage will then be $a + b$ or $a - b$ accordingly as the $k + 1$ st event is correctly guessed or not. There are 2^n possible sequences of Heads and Tails of length n . Let w_1, w_2, \dots, w_{2^n} be the corresponding terminal fortunes (for a given betting scheme). Suppose that a sequence of n bets is to be made. Show that there exists a sequential gambling system on n trials achieving w_1, w_2, \dots, w_{2^n} if and only if $w_i \geq 0$, all i , and $(1/2)^n \sum w_i = w$. Thus, subject to the above rather obvious constraints, every terminal distribution on the gambler's fortune is achievable.

Mr. Rubin writes: "I introduce the following improved (?) notation: 0 = Head, 1 = Tail. $W(i_1, i_2, \dots, i_n)$ is the wealth desired after the sequence i_1, i_2, \dots, i_n where each i is 0 or 1. Let $W(i_1, \dots, i_k)$ be the amount to be had after i_1, \dots, i_k , $0 \leq k \leq n$, and $B(i_1, \dots, i_k)$ the amount bet after i_1, \dots, i_k on the occurrence of tails. Then we have

$$W(i_1, \dots, i_k, 0) = W(i_1, \dots, i_k) - B(i_1, \dots, i_k)$$

$$W(i_1, \dots, i_k, 1) = W(i_1, \dots, i_k) + B(i_1, \dots, i_k)$$

which solves to

$$W(i_1, \dots, i_k) = 1/2 [W(i_1, \dots, i_k, 1) + W(i_1, \dots, i_k, 0)] \quad (1)$$

$$B(i_1, \dots, i_k) = 1/2 [W(i_1, \dots, i_k, 1) - W(i_1, \dots, i_k, 0)] \quad (2)$$

From the first relation we obtain by induction, working backwards from n ,

$$W(i_1, \dots, i_k) = 1/2^{n-k} \sum_{i_{k+1}=0}^1 \dots \sum_{i_n=0}^1 W(i_1, \dots, i_n) \quad (3)$$

from which the bets at any stage can be determined from (2). I note that for $k = 0$, the relation (3) is just $W = 1/2^n \sum W(i_1, \dots, i_n)$, the original condition of the problem.

Mr. Gottlieb, who graduated from M.I.T. in mathematics in 1967, is a teaching assistant at Brandeis University. Send answers and problems to him at the Department of Mathematics, Brandeis University, Waltham, Mass., 02154.

Correspondence Review

Protesting Protest

To the Editor:

Even though this appears to be the "Era of Protest," I wish to express my displeasure with those engaged in defense research at M.I.T. and elsewhere with the one day research stoppage on defense research in protest to the relative amount of funds allocated for defense research compared to social problems research. Let me point out that no matter how learned a research scientist is, the ultimate responsibility for funds allocation rests with the Congress of the United States and not with some self-appointed group of intellectuals.

Let me further point out that those very research projects on which work is halted are a direct result of proposals initiated by the individual research groups who are participating in the stoppage. Now, let's be completely candid. If the work on these projects were not necessary, then the group which submitted the proposal was not completely honest in submitting them. While on the other hand, if the work is important, then is it honest to delay the work on them for one day? I think not!

Let me take one additional step and state that I do believe that each person has the responsibility to express his point of view on all subjects. If the researcher feels that either the project should not be conducted, or that an inordinate amount of work is being expended in a particular area, he has several legitimate methods of protest.

First, he may write his congressman. If one does not think letters to congressmen are effective, he may just look back to the recent furor over gun control legislation. When a significant number of people felt that Congress was about to infringe on what they considered their right to own firearms, they let their views be known and Congress respected their points of view.

Second, the individual researcher has the right to select what research project that he will pursue (to some degree). If he feels so strongly about these projects, he should change jobs and work on something that meets with this approval.

Let us remember that the governing body of this land, the people with the final responsibility, are elected officials. Let's not attempt to usurp their responsibility because a small group of people tend to disagree with their decisions. The system, which several people are protesting, has worked quite well in the past and is still the best system of government available. When this system is no longer the correct system, we can surely change it in an election; but so long as a majority of the people in this land approve the system, then this will be the system followed. Those who disagree have two choices: attempt to change it legitimately, or leave.

Grady B. Nichols
Birmingham, Ala. 35226

Herman Feshbach, Professor of Physics at M.I.T. who was one of the original organizers of the Union of Concerned Scientists, replies as follows:

The position of the faculty sponsors of the event on March 4 at M.I.T. was presented in a faculty statement which was distributed to the M.I.T. community. This statement, together with a list of the distinguished scholars who signed it, has been published in a recent issue of the *Bulletin of Atomic Scientists*. It did not propose a research stoppage of those engaged in defense research. It did not say that the research being carried on at M.I.T. was "unnecessary" or "should not be conducted." It was not a protest against our "system of government."

Our mental and physical environment is to a great extent controlled by technology and science. Our actions and the actions of those who represent us in government are shaped by technology. Technology can be both beneficial and harmful. The faculty statement pointed out that these harmful aspects "present a major threat to the existence of mankind." It pointed to the responsibility of engineers and scientists for making these dangers plain not only to public servants but to the public as well. It questioned whether the present allocation of national resources and talent took these dangers properly into account. Because of the overriding importance of these problems and the immediacy of

the hazards presented, the faculty sponsors invited their colleagues to stop their research for a day which would be devoted to an examination of the present situation. In fact a series of well attended lectures and panel discussions were held on the evening of March 3, throughout March 4, and on March 8. Various problems were delineated and areas requiring study and investigation became apparent.

As an M.I.T. alumnus, may I say that I am proud that it was a group of M.I.T. faculty and students which initiated these discussions which took place not only at M.I.T. but at many of the great universities throughout the United States.

"Equality" Is Not Enough

To the Editor:

We wish to take issue with Mr. Hardy's letter on page 75 of the February issue of *Technology Review*. If it were not for the fact that entirely too much racism, under the guise of "rationality," already permeates American life it would hardly be worth answering.

No, Mr. Hardy, you are wrong. Both this society and all the people in it who benefit from its affluence and M.I.T., which also certainly has benefitted well from the affluence and progress of this country, do not owe black people, forcibly brought to this country and enslaved, merely "equality." They owe them retribution, for both over 300 years of enslavement (the first known Spanish slave colony in North America occurring in 1526 in South Carolina) and the inequality and repression which have followed for the last 100 years or more. Even if M.I.T. were planning a radical program to make some form of retribution to black Americans for the atrocities and indignities suffered by them and their ancestors, it would hardly be overcompensation.

However, we can see no reason why the modest proposals this institution has made in order to search out the qualified people, both black and American Indian (another race to suffer immeasurably at the hand of white civilization), and pre-

vent the wastage of countless more talents and lives which might otherwise occur have aroused Mr. Hardy's ire. The only answers one can find for this is either a total lack of knowledge of American history to date or else blatant racism. If the first is true, then perhaps this letter will cause him to review the situation and consider again whether or not "equality" is sufficient—especially as it is based on judging two people with "unequal" primary and secondary schooling in an "equal" way and making those who have already suffered for 18 years of their lives due to "inequalities" in society suffer for the rest of their lives because of an "equal" judgment. And, if the latter is true, then this letter can be read as an attempt to combat this ugliness in American life whenever it manifests itself.

Frank A. March
Jean S. March
Arlington, Virginia

Who Subsidizes Whom?

To the Editor:

In the last issue of *Technology Review*, one article in the Trend of Affairs section dealt with "Subsidizing the Rich." Sympathetic as I am (both personally and professionally) with the point of view attributed to Dr. Breuning, I am inclined nevertheless to score him for sloppy reasoning.

To say that the public transit lines "associated with the ghetto and the downtown area [are] lucrative from the point of view of paying [their] way" and that "the deficits occur in the low-volume feeder lines and in the low-density areas, where people with higher incomes live" is clearly not to say, as Dr. Breuning did, "so the poor subsidize the rich." Considerably more knowledge about who uses which public transit lines, about the fare payments and costs stemming from usage, about the manner in which the deficits are financed and who contributes towards the financing of deficits, and so forth, is required before any well defined statements can be made about who is or is not subsidizing whom.

Second, Dr. Breuning commented on the fact that "high operating cost occurs in a secondhand car rather than in a new vehicle," a fact which prompted him to suggest that we should force automobile manufacturers to provide a five- or ten-year warranty. Your account read, "The first buyer of a car would pay more than he does now, but he would be giving up 'the subsidy we are now getting from the second user of the car.'" Again the simple facts alluded to by Dr. Breuning hardly permit any inferences about who is or is not subsidizing whom at present. In fact, my inclination would be to assert that presently there is little cross-subsidy between first and secondhand car owners, but if a cross-subsidy does exist it likely would be from the first to the secondhand

car owner (because of the recently established warranty programs and the significant drop in resale market value that occurs during the early years of a vehicle's life). Or, to put the matter another way, the secondhand car buyer is probably getting a "bargain" because of the tremendous drop in car value once it has been used, a drop which probably occurs partially because of the pride or status associated with owning a brand new car and only partially because of its usage, wear-and-tear, increasing operating costs, etc. The secondhand buyer probably gains from having the present warranty program since little if any of the extra cost for that warranty may be passed on to the secondhand buyer.

Martin Wohl
Dearborn, Mich. 48121

The writer is Manager, Transportation Analysis Department, Transportation Research and Planning Office of the Ford Motor Company.—Ed.

To the Editor:

... The auto warranty suggestion? It is true that old cars have higher operating costs than new cars. They also have lower initial prices. In fact, the expected higher operating costs have a good deal to do with the lower prices. Forcing manufacturers to provide long-term warranties would, as Dr. Breuning notes, force up the price of new cars. But since repair work on old cars would be paid for by the manufacturers, the prices of secondhand cars would also rise. It is not at all obvious that the secondhand car buyer would be better off. He would "gain" when repairs were needed but "lose" at the time of purchase.

Since economics is no longer a "dismal" science, let me assure the reader that there is a solution. The problem at issue here is not bus fares and car prices but rather inequitable income distribution. Economists of all shades of the political spectrum have come to support direct redistribution of income through governmental schemes such as the negative income tax, family allowances, and similar approaches. Growing public awareness of the plight of the poor has focused attention in this direction.

Daniel J. B. Mitchell
Los Angeles, Calif. 90024

The author received his Ph.D. from the M.I.T. economics department in June 1968. He is Assistant Professor at the Graduate School of Business Administration, U.C.L.A.—Ed.

The above is a selection from the correspondence received on this topic.

Dr. Breuning writes:

Judging from the response to the brief summary "Subsidizing the Rich" on page 59 of the February issue of *Technology Review*, this would appear to be a touchy issue.

I should like to stress at this point that the panel discussion from which my comments were taken was concerned with the social problems of providing attractive transportation for the poor and not concerned with issues in economic theory. Economists have for too long neglected to deal adequately with the economic representation of social issues or with the dollar equivalence of intangible values.

The main point I was trying to make in the original panel discussion was that in urban transportation, be it mass transportation or automobile, the poor have to expend as much or more for transportation service than the rich. Such a flat statement is, of course, neither fully proven nor universally true. But it is a serious challenge to anyone trying to improve urban transportation. The letters stress the need for more factual studies into these areas.

The heavily used downtown transit lines as well as the center city highways are used and paid for reasonably equitably by everyone. Transit lines into lower density suburban areas have proven deficitary. Similarly, highways from suburban areas into cities are claimed to be supported by a wider group than the affluent white middle class that predominately uses them. Again, these statements are not universally true but give rise to questions regarding the general appropriateness of providing equitable support for a total transportation system.

The question of a subsidy between an old car owner and a new car owner can be debated from various points of view. Neither the letter writers nor I would seem to claim to have a precise and unquestionable answer to this problem. From one point of view, old cars might be considered as providing low cost transport service for the poor. If, as I suspect, they do not do this at a sufficiently low cost, then we have indeed no adequate individual transport service for the poor. This is the basic question I am raising and it is one I feel we must pay much more attention to.

Whether or not a long term warranty would improve this situation is indeed open to question as pointed out by some of the correspondents. It is clear however that a longer term warranty would provide more emphasis by the car manufacturer upon the transportation service the car has to perform than upon its initial sales appeal, where the emphasis now lies.

The interest in these questions as shown by the writers would seem to point to the urgent need to spend more thought and more research on this problem of providing socially more equitable transportation for our urban areas.



Strobe Probe Answer

The picture on page 96 is a high-speed photograph of the formation of lead shot in a shot tower. Liquid lead pours through holes and forms spherical shot which cool as they drop into water. Out-of-focus images of the flash lamp on the spheres cause the interesting pattern.

EDPAC

Electronic Data Processing Air Conditioning

EDPAC . . . a complete, factory-assembled heating, cooling, humidifying, dehumidifying and air cleaning system, designed expressly for data processing centers . . . offering maximum reliability at reasonable cost.

More details? Write:
A.C. MANUFACTURING COMPANY
P.O. Box 287
Haddonfield, New Jersey 08033
or John A. Finnerty, Inc.
Wellesley Hills, Massachusetts 02181

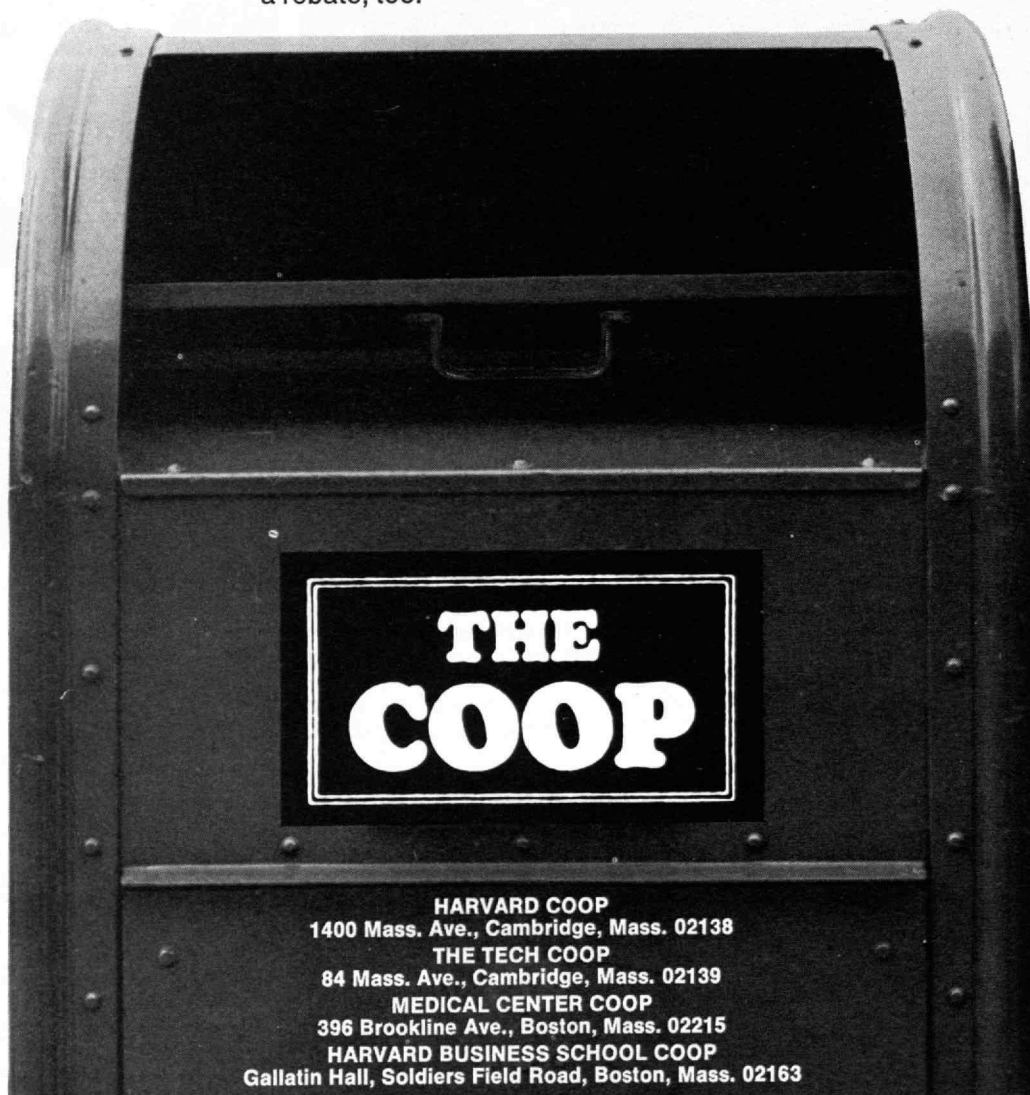
AC
MANUFACTURING COMPANY

Coop Book- store

Shop the Coop bookstore in Harvard Square, one of the largest collegiate bookstores in the country. Its hard-bounds and paperbacks cover in great depth the full range of the humanities, sciences and general literature. Or locate hard-to-find medical, business and scientific titles at the Medical Center, "B" School and Tech Coop stores.

Shop the Coop bookstore from any part of the world. We'll mail any book anywhere. Postage free in the U.S.

As a Coop member, you get all this and a rebate, too.



Become a permanent Coop member (your annual membership fee is charged automatically).

Alumni Review

John I. Mattill, Editor
Brenda Kelley, Alumni News Editor
Deborah Carciere, Assistant

Board of Directors of the
Alumni Association of M.I.T.

Cecil H. Green, '23, President
Donald P. Severance, '38, Executive
Vice President
Robert C. Casselman, '39, Vice President
Ralph H. Davis, '31, Vice President
Breene M. Kerr, '51, Vice President
A. Rufus Applegarth, Jr., '35
Robert C. Cowen, '49
Herbert H. Howell, '42
William H. MacCallum, '24
Angus N. MacDonald, '46
Kemon P. Taschioglou, '49
Frederick G. Lehmann, '51, Secretary

Institute Review

A financial squeeze,—past, present, and future	106
Student "war game" brings peace to the world	108
Urban executives go back to school	108
New fellowships to honor the late Peter J. Eloranta, '68	110
Dean Wadleigh to bow out	110

Alumni News

Retirement stirs nostalgia	115
1969 Homecoming and reunions	115
Coming alumni events	116
A list of classmates deceased	117

Kane on M.I.T.

A calendar of April foolerie Henry B. Kane, '24	118
--	-----

Class Review

Reports of classes and classmates	121
-----------------------------------	-----

Course Review

Affairs of Graduate School alumni in Courses V, VI, XIII-A, and XVI	167
---	-----

Institute Review

An Institution's Financial Squeeze: Costs Up and Budgets Steady

The pace of research at M.I.T. and the Institute's growth rate have been markedly slowed in 1968-69 by the combined forces of rising costs and reduced research income, according to Paul Cusick, Comptroller.

Federal research support is leveling off, decreased financial support for graduate students has contributed to a drop of about 5 per cent in Graduate School enrollment in 1968-69, and next year's budgets for academic activities (1969-70) are now planned to increase only slightly despite continuously rising costs, according to Mr. Cusick.

A Retreat from Commitments

The sharpest pain to date was felt by M.I.T. in the summer of 1968, when the Revenue and Expenditure Control Act of 1968 forced the National Science Foundation and National Institutes of Health to impose a ceiling on institutional expenditures from funds already assured, granted, or even held over from previous years. In M.I.T.'s case, this meant a ceiling of about \$8.5 million on spending of N.S.F. money in 1968-69—in fact a reduction of more than 20 per cent from the total N.S.F.-funded expenditures of \$11 million planned for the year—and a decrease averaging 15 per cent in H.E.W. funds available for the 1968-69 year.

To meet the ceilings, M.I.T. departments agreed to reduce expenses for research equipment and materials, to reduce the number of graduate assistants and research associates, and to reduce secretarial services and travel. Some special consideration was obtained for growing activities where a ceiling based on the previous year's funding would have been especially severe—such as the Education Research Center, the New England Colleges Regional Computing Program, and the ADMINIS Project in the Department of Political Science, an on-line social science data analysis system.

In all, it was "a graceful retreat from commitments already made," says M.I.T. President Howard W. Johnson. But the ultimate effect of the N.S.F. and

H.E.W. 1968-69 ceilings, says Mr. Cusick, has been to stretch out research work, slowing its progress and reducing the number of graduate students associated with it.

Other changes affected the character and progress of research during the current year. Though no arbitrary expense ceiling was applied by either N.A.S.A. or the Department of Defense, program changes were budgeted by both agencies. N.A.S.A.'s support for general activities of the M.I.T. Center for Space Research was reduced from \$900,000 to \$600,000 for 1968-69; but other N.A.S.A. funds for the "Sunblazer" project were increased so that the Space Center's total budget was unchanged. The result, says Mr. Cusick, was to change the Center's emphasis away from fundamental studies toward project-oriented work.

Funding of the Research Laboratory of Electronics, M.I.T.'s pioneer interdisciplinary group which has been supported jointly by the Army, Navy, and Air Force under a single grant system since its founding, is being maintained in 1968-69 at its 1967-68 level; but this amounts to a considerable decrease in support because of the effects of inflation, Mr. Cusick points out.

Otherwise, M.I.T.'s level of commitment from the Department of Defense continues little changed in 1968-69. With contracts of \$119 million, M.I.T. was the largest non-profit defense contractor in 1967-68. Most of this represented support of Lincoln Laboratory, the center for research and development in advanced electronics operated by M.I.T. in Lexington, Mass., and for defense-oriented projects concerned with automatic control and navigation in the Instrumentation Laboratory. These activities will probably continue, and possibly increase, in 1969-70.

"Some Very Tough Numbers"

The high cost of educational technology is the universities' greatest enemy, Mr. Cusick says. The Carnegie Commission on the Future of Higher Education has recently reported that college and university per-student educational expenses are rising at an annual rate of 14 per

cent—far greater than the 2 to 4 per cent annual inflation which the nation has experienced in recent years. And in M.I.T.'s case, says Mr. Cusick, costs have grown more rapidly than even the high Carnegie Commission figure. There are several reasons—notable among them the transfer of sophisticated technology from research and graduate education (where federal support is available) to undergraduate education.

An example is the PDP-1, a computer first built as a research project at Lincoln Laboratory and transferred several years ago to the M.I.T. Department of Electrical Engineering. PDP-1 was first used in Cambridge by faculty and graduate students for their sponsored research, where its costs could be covered under contracts. But increasingly it is being used by undergraduates without sponsorship, and so its expenses must increasingly come out of general Institute funds.

What happens next year? It's still too early to guess what levels of federal support will be approved by the new Congress—or even to know what levels of funding for M.I.T. will be implied in the President's budget, says Mr. Cusick. But Howard W. Johnson, M.I.T. President, says "we are looking at some very tough numbers," and most campus observers expect that 1969-70 will see no resources available for new programs and in general a "hold-the-line" approach.

Almost surely, Mr. Cusick says, M.I.T. will fall behind in its battle with the 14-plus per cent inflationary factor in the cost of education. And, because this 14-plus per cent is a cumulative factor, Mr. Cusick finds the outlook for the 1970's a very uneasy one.

Through Joy and Adversity

It was a nostalgic evening at the M.I.T. Faculty Club when Mrs. Karl Taylor Compton, wife of the Institute's ninth President, shared her "panorama of memories of a galaxy of exciting, dear people" with members of the M.I.T. Matrons (faculty wives) and their husbands this winter.

Mrs. Compton recalled the "bleak picture of Tech" she carried back to Princeton

Recalling that "new beginnings come from every ending," Mrs. Karl Taylor Compton, the wife of M.I.T.'s ninth President, led members of the M.I.T. Matrons and their faculty-husband guests on a nostalgic tour of the Institute's recent past late this winter. Even in the 19 years during which she was M.I.T.'s "first lady," she said, the Institute progressed from unkempt fields and crushed rock lawns, through a World War II "happening," to its postwar greatness. . . from simplicity to complexity.



in the early 20's. At that time, she said, M.I.T. was a grouping of bare white buildings enclosing a courtyard of crushed rock with boardwalk paths, surrounded with a shanty-town of World War I buildings. When in the early spring of 1930 the invitation came for the Presidency of M.I.T., the Comptons decided at first not to come; Dr. Compton was happy enough as a teacher and did not think he should become an administrator, Mrs. Compton said.

But later that winter Karl Compton's mind was changed on a train between Princeton and New York City. When they arrived in Cambridge in the spring Mrs. Compton was astonished to discover grass and rhododendrons in the Great Court—a metamorphosis she attributed to Horace S. Ford, Treasurer Emeritus of the Institute.

There were still summer vacations in those days, Mrs. Compton recalled, and cast-off sheets from the dormitories were in demand to cover the furniture in the President's House. All that ended on the afternoon of December 7, 1941, when John J. Rowlands, then Director of the Institute's News Service, called the President's House to make sure the Comptons were listening to the radio.

Two hours later the first guests at their reception for the Class of 1945 that afternoon caught the Comptons in dressing gowns, still listening. There followed the M.I.T. Radiation Laboratory, "a 'happening' in the very modern sense," Mrs. Compton said, "because it was both so disruptive and so invigorating to the Institute."

Mrs. Compton spoke of the contributions of three great architects to M.I.T.—Welles Bosworth ('89) who implemented President MacLaurin's "insistent concept that the very structure of the new buildings" make "interdisciplinary communication unavoidable"; William W. Wurster ('17) who "equally adamantly insisted" that the main campus, east of Massachusetts Avenue, be reserved for academic buildings; and Eero Saarinen who "prophetically proposed the community's need for seclusion and sanctuary" in arguing for his design for the M.I.T. Chapel (1952).

Are such memories "impertinently trivial in these days of very real concerns?" asked Mrs. Compton. Perhaps—but the past was not without its crises, too. For example, Mrs. Compton recalled the grim faculty meeting during the depression at which it was announced that 5 per cent of the balance of the year's salary checks would be withheld in order to balance the budget. But that was only the beginning: "What economies ensued. . . even to savings in the use of paper and hence in hauling of trash," recalled Mrs. Compton.

How times have changed was in the mind of every member of her audience.

Modern Music and a Persuasive Flutist

Severino Gazzelloni is both an artist and a prince: he is a prince of *glissandos*, double stops, percussion effects, and of a native capacity to charm audiences. He is an artist of the flute.

Last month, M.I.T. heard a particularly complete display of these skills in a highly unusual Sunday afternoon concert which moved from sedate to fascinating to comical yet admirable. Mr. Gazzelloni is a master of new and unusual technical

feats, and some reviewers credit him with a phenomenon called the "Gazzelloni Revolution"—meaning the swift and effective introduction of all these techniques into the repertoire of most accomplished flutists.

An example of both his technical virtuosity and his "revolution" was in "Mei," a solo by the Japanese composer Fukushima, which called for one player and four different types of flutes. Mr. Gazzelloni appeared on stage bearing the four instruments and, with unnerving casualness, set down and picked up each—only the twinkle in his eye conveyed that there was anything at all unusual about the procedure.

In another piece, the "Sonatine" of Boulez, pianist Bruno Canino gleefully crawled inside the piano and hunted for the right strings, and then triumphantly performed solo *pizzicato* passages. Not to be outdone, Mr. Gazzelloni slapped his flute in reply! Other bits of showmanship carried off with equal gusto were the use of more than one music stand, hitting piano strings with a stick, and striking most of the keys of the piano at once with both arms and both elbows.

Despite the noble efforts of the M.I.T. Symphony and the Music Department, these are not things Mr. Gazzelloni's M.I.T. audience is used to seeing; the Humanities Series of which this concert was a part has tended to emphasize more sedate, traditional works. And, as though to tone down the ultramodernity of the program, these works, including "Gymel" by Castiglioni and "Honey-reves" by Maderna, were sandwiched between a Hayden Sonata in G, which led off the program and the Prokofiev Sonata in D Major, Op. 94.

It should not be forgotten that, from a musical standpoint, Gazzelloni's performance was excellent. He appears to have the rare musical gift of reinterpreting a work freshly every time he begins to play, thus continually refining his phrasing, tone and tempo. His music, even at the more absurd moments of stagemanship, is always very much alive. And due to this artistry, as well as his charm, Gazzelloni won converts, perhaps, to the modern school.

The Student Center Library was enlivened this fall by an exhibition of the Catherine Stratton Print Collection—and afterwards by a lottery to determine which print would be loaned to which student applicant for the balance of the term. (Photo: Gary A. DeBardi, '71, from The Tech)



Art by Lottery

The Catherine Stratton Collection of original art, displayed in the Student Center Library late in February, was a sellout.

Prints from the collection—including the works of Miro, Calder, Warhol, Lichtenstein, and others—are rented to students for \$1 (plus \$4 deposit) per term. So brisk was the demand that the final distribution was determined by lottery at the end of the one-week print show.

The Stratton Collection was assembled in honor of the wife of M.I.T.'s eleventh President, Julius A. Stratton, '33, and is administered by the M.I.T. Committee on the Visual Arts.

In A World Run By Students . . .

If the world were run by American students with the educational experience of M.I.T. juniors, there would be little chance of war, says Diane Clemens, Assistant Professor of Humanities at M.I.T. She reached this conclusion after her course (titled "Soviet-American Diplomacy") made students study the interests of different nations and then act them out in an all day "war game" at the end of the term. "Every team came to the game equipped to fight a major war, but there was none," she said.

The 47 students divided into teams; each team represented a country and each student represented a leader or interest group. The teams spent the term studying their individual and national situations, while Professor Clemens ran a control group which—in secret—worked out world scenarios for the year 1970.

The scenario was revealed one Saturday at the end of the term, and thereafter the teams isolated themselves at different computer consoles and the "war game" began. For 10 hours they negotiated, formed alliances and common markets, and carried on espionage. Mao Tse Tung was deposed (by prior agreement) and Red China launched a policy of peaceful co-existence. Three Eastern European nations formed a defensive alliance with the Soviet Union, then joined with the Warsaw Pact countries in a Common

Market. The Soviet Union began to feel that Czechoslovakia, Yugoslavia, and Rumania had betrayed Soviet interests. Then the scenario revealed that Chinese missiles, pointed at the Soviet Union, had been discovered in Albania . . .

"Many real-life situations were reproduced," says Professor Clemens. "For example, some of the smaller countries were bypassed by the others—sometimes for hours. Their leaders then began quarreling among themselves. The computer suffered from an information overload, too, because too many people were transmitting messages. Despite this, some countries maintained good communications; others didn't. China finally bombed Quemoy and Matsu after the other countries systematically refused to believe she meant her pledges of peace."

The outcome? Professor Clemens has received letters from teachers all over the country about the experiment, because, she says, "students are famous for suggesting better ways to do things. So, people are curious to see what happens when you give them some control and put them on the line."

Save the Date—May 3

Research, teaching programs, and special projects will be the focus of the 1969 biennial Open House at M.I.T. on Saturday, May 3, according to Randolph G. Hawthorne, '71, Chairman of the Student Coordinating Committee. More than 20,000 Greater Boston residents are expected to tour the Institute during the day.

Urban Executives: A Management First

When a member of M.I.T.'s first Program for Urban Executives complained that there were too many equations strung across the classroom blackboard, Peter P. Gil, Associate Dean of the Sloan School of Management, told him, "We wanted to tell it like it is, and mathematics is here to stay."

A few other frustrations were also aired at the debriefing which concluded the Institute's first effort this winter to provide intensive studies for municipal of-

ficials. Some in the class were impatient with the fundamentals that the professors insisted on including ("If he'd gone on for another three hours he'd have got to the part we need"), others wished for a more perceptive eye on technology ("What will technology do to make things that now seem to be promising irrelevant in five years?"), and one suggested that his problem was less to know what to do than to know how to do it.

On the last question, John F. Collins, Professor of Urban Affairs at M.I.T. who was instrumental in organizing the program, drew on his experience as two-term mayor of Boston. "We were interested in suggesting sensible and logical solutions to problems," he said, "expecting that the logic would be persuasive. There is no one here or at Harvard or anywhere else who knows as much about your political problems as each of you himself knows."

Twenty municipal officials from as many cities throughout the U.S. came to Cambridge for the four-week Program for Urban Executives organized in the Sloan School of Management during the month of January. One, Joseph F. Canny, '59, Deputy Executive Director of the District of Columbia Redevelopment Land Agency, was an M.I.T. alumnus. They lived at M.I.T.'s Endicott House in suburban Dedham, attended special classes at the Institute, and supplemented the classroom program by inviting many M.I.T. faculty to consult with them at luncheons and dinners.

Their curriculum began with a full week of experience in organization behavior—arranged, said Dean Gil, in the belief that an understanding of the behavioral sciences and, specifically, of how people communicate with each other is critical to success in any field of management.

Afterwards came three weeks of classes oriented around two fields: principles of management and related economics, and specific technological developments applicable to urban problems. Topics in the former series included management information and control, quantitative methods, personnel administration, human aspects of organization, industrial relations, and finance. The technological

developments were reported by such M.I.T. faculty as Charles L. Miller, '51, Director of the Urban Systems Laboratory; Philip M. Morse, Director of the Operations Research Center; Lloyd Rodwin, Professor of Land Economics; Frank C. Colcord, Jr., Assistant Professor of Political Sciences; Lawrence B. Anderson, '30, Dean of the School of Architecture and Planning; John E. Burchard, '23, Emeritus Dean of the School of Humanities and Social Science; Rene H. Miller, Head of the Department of Aeronautics and Astronautics; and William W. Seifert, Sc.D. '49, Director of Project Transport.

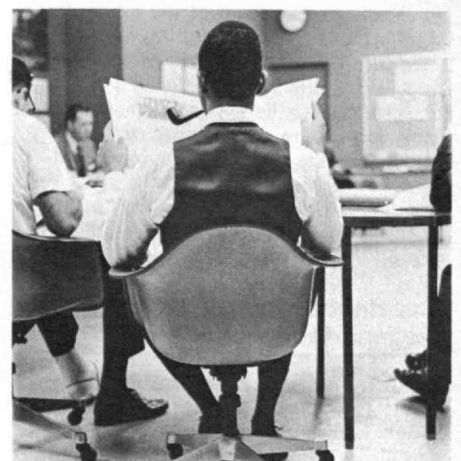
The urban executives seem to have gone home enthusiastic, says Dean Gil. Dan Sweat, Atlanta's Director of Governmental Liaison, told the *Atlanta Constitution* that "though the course didn't make me an instant urban sage, it did challenge some opinions and strengthen some long-held convictions." Another wrote on his evaluation that "cities need this kind of help." Still another, whose reaction was "very favorable," noted that the payoffs "won't come for a long time, but I'm confident I'll find them."

The National League of Cities, with which M.I.T. consulted in establishing the pioneering program, reported to President Johnson with enthusiasm. "We have looked forward to the time when a program of this caliber would be available under the sponsorship of an institution of such stature," said Allen E. Pritchard, Jr., Assistant Executive Director.

Also behind the program were the International City Managers Association and the U.S. Council of Mayors, both of whom lent their support on the grounds that such a program was "long overdue and an essential contribution to the development of urban management."



When 20 municipal officials gathered to "post-mortem" M.I.T.'s first Program for Urban Executives late this winter, they could all agree on one thing: everyone wanted to recommend it to someone else. The four-week program included lectures (left, Lawrence B. Anderson, M.Arch.'30, Dean of the School of Architecture and Planning), a reception for Howard W. Johnson, President of M.I.T. (below, with Peter P. Gil, Associate Dean for Executive Programs in the Sloan School of Management), and lots of talking and reading (bottom left, with Jay W. Forrester, Professor of Management, at Endicott House).



Eloranta Fellowships Announced

President Howard W. Johnson has announced the establishment of three summer research fellowships to honor the memory of the late Peter J. Eloranta, '68, a chemical engineering major who died last summer.

The fellowships were established through a gift to the Institute made by Edwin H. Land, President of the Polaroid Corporation and Visiting Institute Professor of M.I.T. Peter Eloranta's father, Vaito Eloranta, is an employee of the Polaroid Corporation.

The fellowships will support summer research and study for three undergraduates each year at an institution of their choosing—university, government office, or industrial laboratory, in the United States or abroad. All M.I.T. undergraduates will be eligible and applicants will be considered on the basis of the student's past accomplishments and the value to him of the proposed summer program. Applications will be judged by a specially appointed faculty committee.

Naval Science Head

Captain Dean A. Horn, U.S.N. (N.E.'49), has been named to the M.I.T. faculty with joint appointments as Professor of Naval Construction in the Department of Naval Architecture and Marine Engineering and as Professor of Naval Science and Head of the Department of Naval Science.

Captain Horn studied at the U.S. Naval Academy and after assignments in the submarine service entered Navy post-graduate training in 1946. Since completing work at the Institute he has served in three naval shipyards, the Bureau of Ships, and the David Taylor Model Basin in a wide range of design, project engineering and management positions.

Vacating a "Demanding" Job

Kenneth R. Wadleigh, '43, Dean of Student Affairs at M.I.T. since 1961, will leave that post at the end of the current academic year. His plans for next year are not yet certain.

Speaking to *The Tech* of his plans, Dean Wadleigh said that he felt he had made "the most significant part" of whatever contribution he could make to M.I.T. in his present position. *The Tech* added that "this job is one of the most demanding at the Institute, with 'massive commitments to accessibility' and 'a great deal of administrative responsibility,' and so it is 'not surprising' that Dean Wadleigh should leave it after eight years.

Assistant Secretary of Transportation

Secor D. Browne, Associate Professor of Flight Transportation at M.I.T., who is widely known as a consultant in aircraft and airport problems, has been granted

leave from the Institute to become Assistant Secretary for Research and Technology in the Department of Transportation.

Noting that John A. Volpe, Secretary of Transportation, calls the aviation crisis "the most serious problem" facing his Department, the *Boston Herald Traveler* says Professor Browne's appointment "is a welcome development."

Sloan Fellows

Two M.I.T. alumni are among the 50 successful candidates for Alfred P. Sloan Fellowships to the Sloan School's 1969-70 Executive Development Program.

They are Henry K. Hebel, '56, Deputy Manager of the Advanced Surface Missile System Branch of The Boeing Company; and David S. Wilbourn, '55, Vice President—Manufacturing of Baird Chemical Industries.

The new class was chosen from among the largest number of applicants in the history of the program, according to Dean Peter P. Gil, Associate Dean for Executive Programs, and he believes the class will be "a diverse group of exceptional talent, with a wide range of managerial experience to draw upon." Increasing numbers are from administrative assignments in government, education, hospitals, and urban affairs—recognizing, says Dean Gil, the Sloan School's concern with "problem identification, problem solving, and innovation in the area of social issues as well as in business affairs."

Walker and the Muddy Charles

One of the great frustrations of the graduate student at M.I.T. is "a lack of focus" for his activities, explains John Harkness, outgoing President of the Graduate Student Council. But he thinks there is a solution, about to be realized: renovate four rooms on the river side of the Walker Memorial building as places where graduate students can meet, talk, study and plan their own activities.

To achieve this result, M.I.T. began an \$80,000 renovation job on the first-floor rooms of Walker Memorial in February, and the job will be finished with the arrival of new furniture, expected soon. Renovation will be extended during the coming year to the stairways and second story rooms, which are now not officially designated for use by any group but informally are used by editors of the graduate students' paper, *Catalyst*, and the officers of G.S.C.

Two rooms on the west side of Walker's first floor will serve as study and lounge areas, while two rooms on the east side, with high ceilings and stone fireplaces, will hold the G.S.O. offices and the Muddy Charles, a new M.I.T. graduate institution dedicated to the notion that every graduate student should be exposed to the merits of a mug or two of beer at least once every week.

Methinks the Lady Protesteth . . .

The shouts, screams, and songs on the Kresge Auditorium stage in March came not from some new political movement but from "Euphoria," Tech Show 1969, one of the livelier dramatic efforts of the year.

This annual assemblage of student wit and wisdom in musical form, written by Stephen Baxter, '71, and Kenneth A. Martin, '70, drew a few catcalls from M.I.T.'s sister brethren at Wellesley. A reviewer from the *Wellesley News*, ironically bearing the name of Pat Nicely (Wellesley, '71), panned Tech Show completely.

"The show is an attempt to satirize just about everything, from computerized dating to all the old show business clichés of the past 50 years. With such a broad aim as that, how could it help but fail?

"In all, 'Euphoria' is a fragmented, amateurish, generally unfunny two hours of stale jokes and mediocre music.

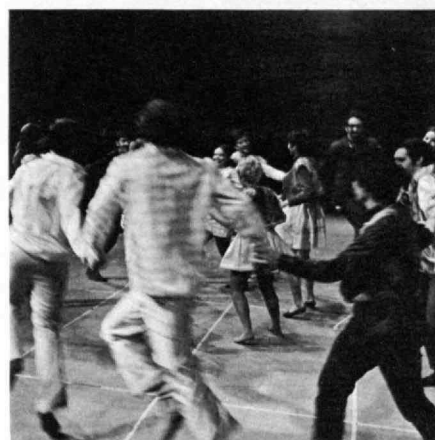
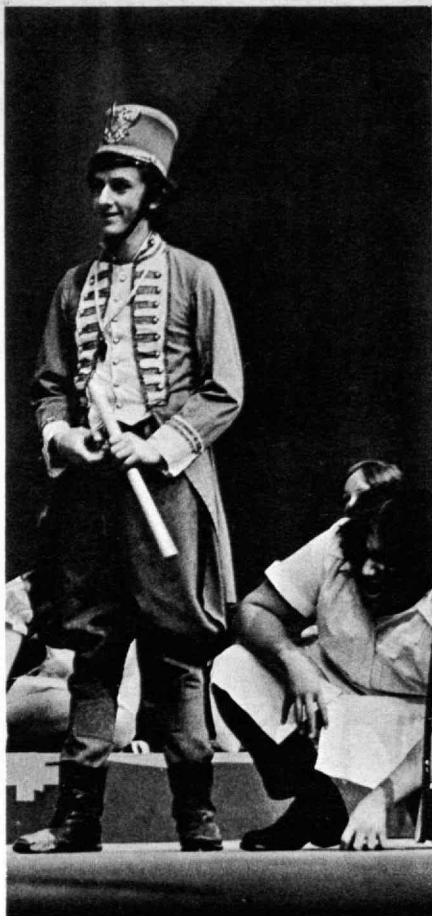
"Revolving around the romance between sweet Alice and tough Louie, the plot involves a trip to the state of Euphoria, ruled by an Uncle-Sam-like Great Leader, Pomley, and run by a very-real-live-girl-like computer named Suzy. In Euphoria, everyone must be happy all the time, under penalty of 'heart surgery' performed by Miss Mayhem, a typical mad scientist who seems to be a cross between comedian Marty Allen and a grizzly bear.

"Hackneyed as this is," continued our veteran, "this kind of story line does have potential for the type of show 'Euphoria' tries to be. Unfortunately it is killed by an incredibly trite script, monotonous songs, and just plain bad performances by the majority of the cast." Two exceptions: the Keystone Cops, a "barber-shop" song-and-dance troupe, and Suzy, the computer, who "presents a convincing performance and delivers her songs in a voice that, while it is not outstanding, at least is audible in all parts of the auditorium." At last, Tech scored.

Individuals Noteworthy

To *Frederick T. Rall, Jr.*, '50, Chief of the F-15 Airframe Division, Aeronautical Systems Division, U.S. Air Force, the Exceptional Civilian Service Award for engineering contributions to the F-111 aircraft . . . To *Robert H. Rediker*, '47, M.I.T. Professor of Electrical Engineering, the David Sarnoff Award of the Institute of Electrical and Electronics Engineers "for contributions to semiconductor device research and injection lasers."

To *Benjamin Lax*, Ph.D.'49, Director of the Francis Bitter National Magnet Laboratory at M.I.T., the Gano Dunn Medal of the Cooper Union Alumni Association "for distinguished professional achievement" . . . To *Donald G. Fink*, '33, General Manager of the Institute of Electrical and Electronics Engineers, the



In pictures Tech Show 1969 looks very like its recent predecessors; perhaps it was the genre of the reviewer which made a difference. Pat Nicely, writing in the Wellesley News, said that she and her classmates "were generally surprised by the lack of those elements characteristic of a Wellesley Junior Show—puns, put-downs, off-color jokes, and an awareness of the current world scene." (Photos: Owen D. Franken, '69)

I.E.E.E. Executive Committee's special commendation for his work as Editor in Chief of *The Standard Handbook for Electrical Engineers* tenth edition (1968).

To *Rene Miller*, Head of the M.I.T. Department of Aeronautics and Astronautics, the Sylvanus Albert Reed Award of the American Institute of Aeronautics and Astronautics for "outstanding contributions to the fundamental knowledge . . . of rotary wing aircraft" . . . To *Nathan Cohn*, '27, Executive Vice President of Research and Corporate Development, Leeds and Northrup Company, the Franklin Institute's 1968 John Price Wetherill Medal for contributions to the electrical industry.

Hubert L. Barnes, '50, to Head of the Ore Deposits Research Section, College of Earth and Mineral Sciences, the Pennsylvania State University . . . *Charles E. Smith, Jr.*, '49, to Vice President—Operations of Robert Heller Associates, Inc., Cleveland Management consultants . . . *Charles J. Lawson, Jr.*, '43, to President and Chief Operating Officer of Rotron, Inc.

J. Herbert Hollomon, '40, President of the University of Oklahoma, chosen President of the Mid-America State Universities Association . . . *Robert C. Seamans*, Sc.D.'46, Secretary of the Air Force, elected President of the American Institute of Aeronautics and Astronautics.

Albert C. Zettlemoyer, Ph.D.'41, to Vice President and Provost, and *Joseph F. Libsch*, '40, to Vice President for Research at Lehigh University . . . *Alan P. Sloan*, Ph.D.'67, to Vice President of CBS Television Stations Division and General Manager of WCB-TV, New York.

Gerald P. Dinneen, Assistant Director of M.I.T. Lincoln Laboratory, to Vice Chairman of the National Research Council Committee on Undersea Warfare. . . . *Crawford H. Greenewalt*, '22, to Chairman of the Organizing Committee for the 23d International Congress of Pure and Applied Chemistry . . . *Curtis D. Buford*, '42, to President of Trailer Train Company . . . *John M. Wozencraft*, Sc.D.'53, to Associate Head of Division 6 at the M.I.T. Lincoln Laboratory.

Charles W. Burnham, '54, to Professor of Mineralogy; *Yu-Chi Ho*, '53, to Gordon McKay Professor of Engineering and Applied Mathematics; and *Ivan E. Sutherland*, Ph.D. '63, to Gordon McKay Professor of Electrical Engineering—all effective July 1, 1969, at Harvard University . . . *Charles H. Ehlers*, '52, to Vice President—Manufacturing of Dewey and Almy Division, W. R. Grace and Company. . . . *William A. Zisman*, '27, to the Chair of Science for Chemical Physics at the Naval Research Laboratory . . . *Karl Pfister*, '40, to Senior Vice President—development at Merck, Sharp and Dohme Research Laboratories . . . *Bernard P. Spring*, M.A.R.'51, to Dean of the New School of Architecture at the City College of the City University of New York.



Mid-Winter Vacation

The mid-term break in class schedules early in February found the M.I.T. ski team in the New England mountains, as usual. But this year there was a difference: lots of snow, more—in many places—than ever before in ski-resort history. The result made for lots of time on the slopes and some good pictures for *Technology Review*, though the team ended the season with the usual modest record in intercollegiate competition. (Photos: Jeffrey M. Reynolds, '69)



Paul E. Dutelle, Inc.

Roofers and
Sheet Metal Craftsmen

153 Pearl Street
Newton, Massachusetts
02158

Margolis Marketing & Research

Automotive Polymer Reports
Other Polymer Reports
Computer Systems for Management
Maricopa Weather Testing Facility
Special Projects

James M. Margolis '52
280 Mamaroneck Avenue
White Plains, New York 10605

Science/ Engineering Alumni Magazines

Advertisers can reach
the alumni of 32 major
universities with a high
percentage of science and
engineering graduates
at discounted rates

For details write:
American Alumni Magazines
50 East 42nd Street
New York, New York
10017

Lord Electric Company Inc.

Electric Contractors
to the Nation
Since 1895

Medford, Mass., Chicago
Pittsburgh, Portland, Ore.
Los Angeles, Richland, Wash.
San Francisco, San Juan, P.R.

Medford Office:
4080 Mystic Valley Parkway
(617) 396-9110

Swindell- Dressler Company

A Division of Pullman Incorporated
Engineers

Civil and Public Works—Transportation
Systems—Industrial Facilities

441 Smithfield Street
Pittsburgh, Pennsylvania
15222

Charleston, West Virginia—Harrisburg,
Pennsylvania—Chicago, Illinois

Chas. T. Main, Inc.

Engineers
Studies and Reports
Design
Construction Management

441 Stuart Street
Boston, Massachusetts 02116
617/262-3200

1301 E. Morehead Street
Charlotte, North Carolina 28204
704/375-1735

Syska & Hennessy, Inc.

Engineers

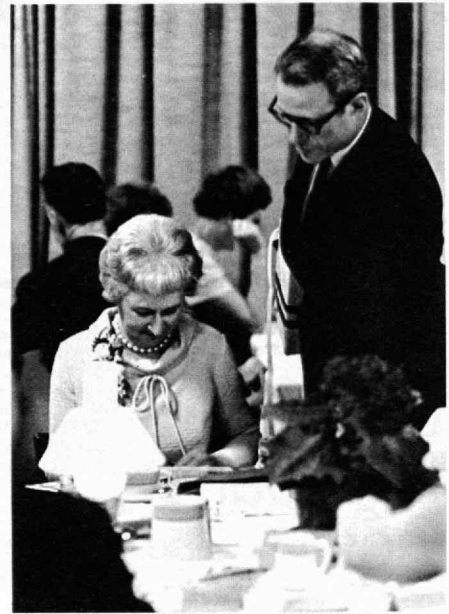
Design-Consultation-Reports
Mechanical-Electrical-Sanitary
Elevator and Materials Handling

John F. Hennessy '24,
John F. Hennessy, Jr. '51

144 East 39 Street
New York, New York
10016

1720 Eye Street, N.W.
Washington, D. C.
20006

Alumni News



When it happens only once in 40 years, Technology Review may perhaps be forgiven for publishing pictures of itself; these record a late-winter reception to honor Ruth King upon her retirement as Associate Editor.

In addition to the honored guest, who is beloved by generations of Review editors and M.I.T. class secretaries, the principals included (top) Frederick G. Fassett, Jr., Dean of Residence Emeritus who was Editor of the Review from 1939 to 1945, and Donald P. Severance, '38, Publisher; (center, right) John I. Mattill, present Editor; (below left) Dr. and Mrs. James R. Killian, Jr. ('26); and (below, right) Claire Enwright, one of many Alumni Office friends who joined in the tribute to Miss King. (Dr. Killian, now Chairman of the M.I.T. Corporation, was Editor of the Review from 1930 to 1939.) (Photos: Owen D. Franken, '69)



Technology Review: Nostalgia—Freely Flowing

More than 100 friends from every department of M.I.T. and representing most of the alumni classes joined at the M.I.T. Faculty Club late this winter to honor Ruth King, Associate Editor, Emerita, of *Technology Review*, upon her retirement after 40 years' service to the magazine (see *Technology Review for February*, p. 85).

Two former editors—James R. Killian, Jr., '26, now Chairman of the Corporation, and Frederick G. Fassett, Jr., of Damariscotta Mills, Maine, now Dean of Residence, Emeritus, were present. And two others—Beverly Dudley of Washington, D.C., and Volta W. Torrey of N.A.S.A.'s Technology Utilization Office, Washington—unable to be present, sent special messages.

Mrs. Ralph T. Jope ('26), whose husband was for many years Business Manager of *Technology Review*, presented Miss King with a Polaroid camera on behalf of her many alumni friends; Donald P. Severance, '38, Executive Vice President of the Alumni Association and Publisher of *Technology Review*, presented the traditional Wedgwood plates on behalf of the Association; and John I. Mattill, Editor of *Technology Review*, presented a Steuben vase as the gift of Miss King's many Cambridge friends.

Nostalgia flowed freely. It makes for good memories—but poor reading.

Homecoming Day: Problems in the "Human Purpose"

A program for Alumni Homecoming Day on Monday, June 16, designed to recognize M.I.T.'s special concerns with "problems that bridge across more than one field and deal with the human purpose," in the words of President Howard W. Johnson, has been announced by Claude W. Brenner, '47, Chairman of the 1969 Alumni Day Committee.

In the traditional format of Homecoming Day and in accordance with this theme, says Mr. Brenner, there will be presentations of such topics as technology in art, environmental values in highway design, petroleum-protein conversion, waste disposal problems, and the use of computers in relation to social problems. The afternoon session will be moderated by Dr. James R. Killian, '26.

Among the day's speakers, in addition to President Johnson, will be John F. Collins, Professor of Urban Affairs, Jay W. Forrester, S.M.'45, Professor of Management; Alfred H. Keil, Head of the Department of Naval Architecture and Marine Engineering; Gyorgy Kepes, Director of the Center for Advanced Visual Studies; Marvin L. Manheim, '59, Associate Professor of Civil Engineering; Steven R. Tannenbaum, '58, Assistant Professor of Food Science; and David G. Wilson, Associate Professor of Mechanical Engineering.

The day's activities will include luncheon, late-afternoon cocktail hour, and the annual banquet. In addition, for reunion classes returning to Cambridge on Sunday evening, there will be an "international" buffet supper at the Student Center. Full details will be available for publication in *Technology Review* for May, according to Mr. Brenner.

New England Homecomings

More than 3000 M.I.T. alumni in classes from 1899 to 1964 will return to New England in June for reunions and Homecoming Day activities at M.I.T.

If tradition holds, the largest contingent will be in the Class of 1944, whose 25th reunion will open on the M.I.T. campus on Friday afternoon, June 13. Burton A.

Bromfield is in charge of arrangements for his class, whose activities will include a traditional faculty luncheon on Saturday noon and a number of seminars as well as social events. A campus-oriented recreation program is planned for children so that the reunion can be a family affair.

The 50-year Class of 1919 will arrive at M.I.T. on Thursday, June 12, to participate as honored guests in Commencement activities on June 13; they will then adjourn to Chatham Bars Inn for a reunion program, including a banquet on June 14 with Howard W. Johnson, President of M.I.T., the principal speaker.

Two other classes—1914 and 1909—will be on the campus for the week-end; one—1949—is planning the first Bermuda reunion in the history of M.I.T. alumni

1969 Reunions

	Location	For further information
1964	Red Jacket Motor Inn Bass River, Mass.	Robert H. Scott 49 Jacqueline Road Waltham, Mass., 02154
1959	Wentworth-by-the Sea New Castle, N.H.	Alan S. Bufferd 8 Whitney Road Newton, Mass., 02160
1954	Jug End Inn South Egremont, Mass.	Robert D. Warshawer 11 Tower Road Lexington, Mass., 02173
1949	Castle Harbour Hotel Hamilton, Bermuda	Stanley Margolin 215 Grove Street Auburndale, Mass., 02166
1944	Baker House, M.I.T. Cambridge	Burton A. Bromfield 72 Woodchester Drive Weston, Mass., 02193
1939	Wychmere Harbor Club Harwichport, Mass.	Ernest R. Kassell 67 Paulson Road Waban, Mass., 02168
1934	Harborside Inn Edgartown, Mass.	Paul Wing, Jr. 12 Weston Road Hingham, Mass., 02043
1929	Wianno Club Osterville, Mass.	William Baumrucker 363 Ocean Avenue Marblehead, Mass., 01945
1924	Bald Peak Colony Club Melvin Village, N.H.	Russell Ambach 135 Aspinwall Street Brookline, Mass., 02146
1919	Chatham Bars Inn Chatham, Mass.	Wilfred O. Langille Box 144 Gladstone, N.J., 07934
1915	M.I.T. Faculty Club Cambridge, Mass.	Azel W. Mack 100 Memorial Drive Cambridge, Mass., 02139
1914	McCormick Hall, M.I.T. Cambridge, Mass.	Leicester F. Hamilton 100 Memorial Drive Cambridge, Mass., 02139
1909	McCormick Hall, M.I.T. Cambridge, Mass.	Arthur L. Shaw 290 Central Street Auburndale, Mass., 02166

building construction alterations

**H. H.
HAWKINS**
AND SONS COMPANY
175 California St.
Newton, Mass. 02158

STEVE HAWKINS '57

affairs; and seven other classes have made reunion plans at New England locations ranging from the Berkshires and the White Mountains to Cape Cod. Several informal "off-year" reunions have also been announced; for example, the Class of 1915 will meet for cocktails at the M.I.T. Faculty Club from 4 to 6:30 on Alumni Day, June 16.

M.I.T. Club of Southern California

The M.I.T. Club of Southern California held its annual meeting at the Century Plaza Hotel on January 7, 1969. Seventy-eight alumni and guests attended the festivities which began with a cocktail reception for William F. Pounds, Dean of the Sloan School of Management.

President Chetron, '56, initiated the Club's business meeting following dinner by introducing George Cunningham, '27, Chairman of the Nominating Committee, who in turn reported the nomination of Ben Thompson, '38, President, Robert McKenzie, '31, First Vice President, and John Wittels, '47, Second Vice President. The Committee's nominations were seconded and elected by acclamation. President Chetron then introduced the principal speaker, Dean Pounds. Dean Pounds first took a few moments to bring attending alumni up to date on what is going on at the M.I.T. campus. He described the success of the non-graded study experiment which has led to adoption of a completely non-graded freshman year for the first time in M.I.T.'s history. He discussed the surging interest of the students in community affairs as well as school curriculum and administrative issues. With enthusiasm he pointed to the new sense of communication that seems to be developing between faculty and students.

Dean Pounds then shifted to his principal topic of the evening, "New Opportunities in Management." He described the Sloan School's shift in perspective from management of industrial organization alone, to the inclusion of management of organizations such as governmental bodies, schools, and hospitals. He pointed to several public service projects in which Sloan School faculty and students are participating with members of local governments in working on pressing problems. In the area of industrial marketing, Professor Little's computer model for selecting advertising media, MEDIAC, was described. The audience was tantalized by the prospects of over 100 per cent stock market appreciation through the use of Professor Amstutz's portfolio management model as well as other exciting topics.

M.I.T. Club of Dallas: Opportunity and Transportation

"A year ago I was rather skeptical about the Institute. But now I wouldn't be anywhere else," is the way Ralph D. Witschey, Jr., '72, put it to more than

25 high school students who were guests of members of the M.I.T. Club of Dallas on Monday, December 30—one of at least 15 meetings sponsored by M.I.T. alumni clubs to introduce vacationing students to high school "hopefuls" throughout the country.

Mr. Witschey emphasized to his audience the wide variety of people and activities which he had found during his first four months at M.I.T. "Anything you could possibly want to do or study is found there," he said, "and everyone can find a fit." He also spoke with enthusiasm of the "pass-fail" system for grading freshman subjects; it "reduces the pressure for grades," he said, "and it helps you adjust to the changes."

James Gathings, Manager of the Tracked Air Cushion Research Vehicle Program at Ling-Temco-Vought in Dallas, was principal speaker of the day, and he took the opportunity to emphasize the importance and potential of many kinds of ground transportation in the U.S. One-third of the country's gross national product goes directly or indirectly into transportation, he said, and students interested in engineering have "a tremendous opportunity in this field." Mr. Gathings spoke briefly of his own group's work in the field of ground transportation and showed films of new developments in Japan and France. He noted that government is now the only source which can accomplish "a general and systems improvement in transportation," but he said that the time scale of transportation developments is now too slow. At the present rate, he said, it will be 1980 before the nation has a "fully developed" mass transportation system, "and that is too far away when you can see so much of the problem of transportation already troubling us."

Fairfield County

Charles E. Kendall, Vice President—Management Services of the Franklin National Bank in New York City, spoke on "So You Want to Go Into Business—A Banker's View" at the third dinner meeting of the M.I.T. Club of Fairfield County on February 18, at the Westport Clam Box. Dinner was preceded by a social hour.

Alumni Calendar

Baltimore—April 10, Thursday, 6:30 p.m.—Dinner Meeting, Holiday Inn Downtown. Speaker: R. Dixon Speas, '40, President, R. Dixon Speas Associates, a subsidiary of Planning Research, Inc. Topic: Results of his organization's latest survey of the nature of air congestion at Friendship and Dulles Airports.

Boston—April 10, Thursday, 12:00 Noon—Luncheon, Union Oyster House, 41 Union Street. Speaker: Frank T. Parris, Jr., Vice President, Fidelity Management and Research Co. Topic: Financial and investment outlook for 1969.

Dallas—April 23, Wednesday, 7:00 p.m.—M.I.T.-Wellesley joint meeting at Mr. and

KULITE

METALLURGY

Tungsten, molybdenum, cobalt, special alloys — fabrications. "HI-DENS" tungsten alloys — for counterweights and shielding.

SOLID STATE SENSORS

Semiconductor strain gages, integral silicon force sensors and temperature sensors for measurement and control applications.

Anthony D. Kurtz, 1951

Ronald A. Kurtz, 1954

KULITE

(Kulite Semiconductor Products, Inc.,
Kulite Tungsten Co., Inc.)
1030 Hoyt Avenue, Ridgefield, N. J.

Mrs. Thomas Kennedy's home, 911 Hathaway. Informal program with wine taste and buffet.

Denver—April 11, Friday, 6:00 p.m.—Dinner Meeting, Lamppost Restaurant. Speaker: Walter Orr Roberts, Director, The National Center for Atmospheric Research. At 8:00 p.m., a tour of N.C.A.R. in Boulder.

New York—April 17, Thursday, 8:30 p.m.—Concert, M.I.T. Symphony Orchestra, Carnegie Hall. Cocktail party and buffet at Carnegie Hall precedes the concert from 6:45 to 8:05 p.m. Black tie optional.

New York—April 21-22, Monday and Tuesday—Seminar, Arden House, Harriman, New York. Speakers: Michael W. Blumenthal, President Bendix International; Sloan School Professors Donald C. Carroll, '58, and Mason Haire; and others. Topic: "Strengthening Management for the Seventies."

New York—April 30, Wednesday, 12:00 p.m.—Luncheon, Harvard Club. Speaker: Mortimer Rogoff, Vice President, John Diebold, Inc. Topic: Next Great Growth Industry.

Portland, Maine—May 15, Thursday, 6:00 p.m.—Dinner, Holiday Inn. Speaker: Donald P. Severance, '38, Executive Vice President of the Alumni Association

Providence—April 10, Thursday, 12:00 Noon—Luncheon Get-Together at Johnsons Hummock.

Seattle—April 3, Thursday, 6:00 p.m.—Joint M.I.T.-Wellesley Dinner Meeting, Washington Athletic Club. Speaker: Professor Harold E. Edgerton, '27.

St. Louis—April 12, Saturday—Regional Conference, Park Plaza Hotel. Speakers: President Howard W. Johnson; Samuel A. Goldblith, '40, Deputy Head of the Department of Nutrition; Robert W. Mann, '50, Professor of Mechanical Engineering; Irwin W. Sizer, Dean of the Graduate School; Raymond L. Bisplinghoff, Dean of the School of Engineering; John F. Collins, Visiting Professor of Urban Affairs; Cecil H. Green, '23, President of the Alumni Association.

Class Reunions—June 14-15, 1969

Homecoming—June 16, 1969

Alumni who travel are invited to attend these Alumni Club programs.

Deceased

Henry C. Morris, '00, December 29, 1968
Frank A. H. Kelley, '06, December 31, 1968
H. Leston Carter, '08, February 23,
James M. Burch, Jr., '08, January 14*
Joseph Pope, '08, January 20
Edward J. Riley, '08, February 2, 1966
Ernest Whitten, '08, January 14
Clarence J. Brown, '09, September 1968
Jay W. Cilley, '10, January 4
Stuart B. Copeland, '11, January 7



Architect Marcel Breuer addressing an M.I.T. Alumni Center of New York luncheon on February 20. Mr. Breuer discussed new engineering developments, such as precasting, pre- and post-tensioning of concrete, and showed how they enabled the architect to create artistic and economical structures. Advice was offered on planning against the corrosive atmosphere of large cities by considering how a structure will appear over a period of time. (Photo: Gene Belkin, '53)

William C. Davis, Jr., '11, December 1
W. J. Seligman, '11, November 1968
Edwin C. Vose, '11, February 2
Henry Adams Johnson, '12, January 17
Henry H. Partridge, '12, November 24, 1968

Raymond C. Bergen, '13, October 1, 1968
George A. Richter, '13, December 3, 1968
Herbert H. Hall, '14, December 6, 1968
Wesley H. Blank, '16, January 9
Kenneth C. Richmond, '16, January 20*
Robert S. Moulton, '17, January 20*
Jay J. Sindler, '17, December 25, 1968
Irving Chernoff, '22, November 22, 1967
Harry M. Chatto, '23, December 10, 1968
William J. Frisbie, Jr., '24, December 6, 1968

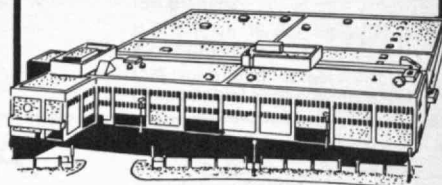
J. Frederic Walker, '25, January 7
Stanley R. Howe, '26, August 17, 1968
William M. Grosvenor, Jr., '28, June 22, 1968
Allen S. Richmond, '28, January 24
Donald R. Schumann, '29, February 1967
David J. Crawford, '32, March 20, 1959
Walter R. Oppen, '33, October 20, 1968
Eleanor H. Higby, '34, November 1, 1968
Michael J. Lach, '36, February 12*
Kenneth W. Root, Jr., '39, November 24, 1968

Jacques A. Lewis, '44, August 4, 1968
John T. Castles, '47, January 1
Frederick W. Cordner, '50, January 5
Miss Ana M. Gundlach Mayer, '53, October 17, 1966
Kenneth S. Welsh, '58, December 26, 1968

Walter R. Roehrs, '62, August 9, 1966
Kenneth S. Bright, '67, February 21

*For further information see Class Review

BUILT BY
W. J. BARNEY CORP.



Pan American World Airways

Abbott Merkt & Co.
Engineers & Architects

Offsetting High Costs

In construction, the way to lick high costs is through greater efficiency and coordination. That means using a builder who has ability, experience and ingenuity.

We have been noted for these qualities for more than 50 years, having built for many of the country's outstanding companies. And year after year more than 70% of our business comes from those for whom we have built before.

W. J. BARNEY CORPORATION

Founded 1917

INDUSTRIAL CONSTRUCTION

101 Park Avenue, New York

Alfred T. Glassett, '20, President

Robert F. Lathlaen, '46, Vice President

**If you ignore it,
maybe it'll go away.
And other famous
cancer legends.**



"What I don't know can't hurt me." "Never sick a day in my life." The list of excuses is endless. We don't need any more slogans like these. Annual checkups can help save thousands more every year. Help yourself with a checkup. And others with a check.

American Cancer Society













NAMEQUOIT

ORLEANS, CAPE COD

On salt-water bay, fresh-water lake. 130 boys, 7-18; 4 age groups. Fleet of sailboats; instruction in racing. Swimming, canoeing, fishing. Tennis, riflery, baseball, gymnastics. Educational trips, crafts. Experienced staff. Tutoring. 44th year. Catalog A. T. Farnham, One Glover Road, Wayland, Mass. 01778.

Kane on M.I.T.

AN (APRIL) ALMANACK ♡♡♡♡

1 Tu ALL-FOOL'S DAY Baseball, Golf, Tennis, Lacrosse teams, head south ~ no Fools they! 	11 Fr The All-Tech Sing makes the Welkin Ring at Kresge 	21 Mo PATRIOT'S DAY? New Yorkers hold 2-day Seminar to Strengthen Management at Arden House 
2 We  FULL MOON Lacrossers "play" C.W. Post on Long Island 	12 Sa All-day Regional Conference ~ St. Louis. Crew races Columbia on Charles. Brigham Young Folk Dancers.	22 Tu Baseball team meets Harvard at Harvard 
3 Th MAUNDY THURSDAY MIT & Wellesley alumni in Seattle hear Flash Edgerton 	13 Su Folk Dance Festival at the Stratton Center 	23 We MIT & Wellesley alumnae/i taste wine and sample buffet in Dallas 
4 Fr GOOD FRIDAY Only 15 days before fishing season opens 	14 Mo Technology Dames hold Fashion Show 	24 Th Some Dallas alumnae/i vow to concentrate on buffet in future 
5 Sa Dinghy Regatta at Tufts ~ Boston Dinghy Cup at Coast Guard 	15 Tu  YOUR MOMENT OF TRUTH! INCOME TAX DAY!	25 Fr Spring Weekend High School Science Fair - American Nuclear Society Student Conference 
6 Su EASTER 	16 We MIT ~ Tufts baseball game at Briggs Field 	26 Sa Daylight Saving ~ "Spring Ahead, Fall Back." Compton Cup crew races on Charles 
7 Mo Lent is over ~ So is Spring Vacation 	17 Th MIT Symphony Concert at Carnegie Hall ~ with cocktails & buffet 	27 Su Dinghies compete for Oberg Trophy on Charles 
8 Tu MIT vs BC in first home baseball game  MIT - UNBEATEN (at home)	18 Fr International Student Weekend Walker "A" Ball 	28 Mo Lacrosse team travels to Wesleyan 
9 We Lacrosse Team Hosts Harvard, as Harvard Hosts Tennis Team 	19 Sa Super Saturday! Crew vs Northeastern and BU • Open Invitational Dinghy Races on Charles • Peking Opera • APO Carnival *****	29 Tu Greater Boston Colleges AA track meet at Boston College 
10 Th Alumni meet in: Baltimore, to hear about Air Congestion; Boston, money; Providence, to eat 	20 Su Geiger Trophy Dinghy Races on Charles Glee Club Concert ~ Kresge 	30 We New York alumni lunch at Harvard Club, hear about Growth Industries 

Brewer Engineering Laboratories Inc.

Consulting Engineers
Experimental Stress Analysis, Theoretical Stress Analysis, Vibration Testing and Analysis, Specialized Electro-Mechanical Load Cells and Systems, Structural Model Testing and Fabrication, Strain Gage Conditioning and Monitoring Equipment.
G.A. Brewer '38,
Marion, Massachusetts 02738
(617) 748-0103

Capitol Engineering Corporation

Consulting Civil Engineers
Robert E. Smith '41, President
Dillsburg, Pennsylvania, USA

Cleverdon, Varney and Pike

Consulting Engineers
Structural, Electrical, Civil, Heating and Ventilating, Air Conditioning, Plumbing
120 Tremont Street
Boston, Massachusetts 02108

Charles Nelson Debes Associates, Inc.

Engineers and Consultants
Structural, Electrical, Mechanical, Acoustical, Industrial, Commercial and Municipal Projects
C.N. Debes '35
915 East State Street
Rockford, Illinois

Fabric Research Laboratories Inc.

Research, Development, and Consultation in the Fields of Fibrous, Organic, and Related Materials
W.J. Hamburger '21,
E.R. Kaswell '39, K.R. Fox '40,
M.M. Platt '42
1000 Providence Highway
(At Route 128 and US 1 Interchange)
Dedham, Massachusetts

Fay, Spofford & Thorndike, Inc.

Engineers
Boston, Massachusetts

Jackson & Moreland

Engineers and Consultants
Division of United Engineers & Constructors, Inc.
Boston, Massachusetts

The Kuljian Corporation

Engineers-Consultants
Utility-Industrial-Chemical
Power Plants (Steam, Hydro, Nuclear), Public Works, Processing Plants, Oil Refineries, Textile Plants, Institutions, Highways, Expressways, Airports & Facilities, Military Installations
H.A. Kuljian '19, E.J. Healy '24
A.H. Kuljian '48
1200 North Broad Street
Philadelphia, Pennsylvania 19121

Harold A. McCrensky Associates, Inc.

Management Consultants
Work Standards; Incentive Plans; Management Controls; Standard Costs
H. A. McCrensky '38, President
J. L. Gould HBS '37, Vice President
G. Beesley '39, Senior Consultant
H. E. Jans '52, Senior Consultant
Park Square Building
31 St. James Avenue
Boston, Mass. 02116
Telephone: 617-542-2640

Metcalf & Eddy, Inc. Engineers

Boston • New York • Palo Alto
Engineers and Consultants to Government and Industry
Water and Air Pollution Control
Water Supply and Waste Disposal
Transportation Facilities
Community Planning and Urban Renewal

Mueser, Rutledge, Wentworth & Johnston

Consulting Engineers
Foundations for Buildings, Bridges and Dams-Tunnels-Bulkheads-Marine Structures-Soil Studies and Tests-Reports, Design and Supervision
William H. Mueser '22,
Philip C. Rutledge '33
415 Madison Avenue
New York, New York 10017

Maurice A. Reidy Engineers

Foundations and Soil Mechanics
Structural Designs, Buildings, Bridges
101 Tremont Street
Boston, Massachusetts 02108

Soil Testing Services, Inc.

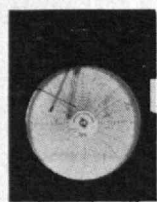
Consulting Soil and Foundation Engineers
Site Investigations, Foundation Recommendations and Design, Laboratory Testing, Field Inspection and Control
Clyde N. Baker, Jr. '52,
Sylvio J. Pollici '56
111 Pflingsten Road
Northbrook, Illinois

Technology International Corporation

Applied Science and Technology
Boston and Bedford
Massachusetts

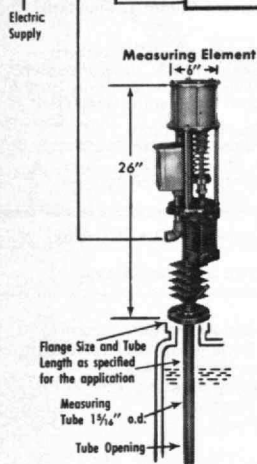
NORCROSS Viscometer

for Vacuum and Pressure Applications



RECEIVER
RECORDS VISCOSITY
AND TEMPERATURE

Any 3 - 15 psig temperature
transmitter can be used.



The NORCROSS Viscometer is applicable to a variety of processes for oils, resins, adhesives, emulsions and synthetic fibers. Models are available to meet the particular temperature and pressure conditions. They are applicable from .1 to 1,000,000 cp and furnished for the desired intermediate range.

A PROVEN PRINCIPLE • EASY TO INSTALL • SELF-CLEANING • RUGGED AND DEPENDABLE • CORROSION RESISTANT • EXPLOSION PROOF

Austin S. Norcross, '29 Frederick J. Elmert, '32 Robert A. Norcross, '51
for full details write Dept. A-69

NORCROSS CORPORATION Newton, Mass. 02158

Representatives in Principal Cities and Foreign Countries

The 1969

Alumni Homecoming in Cambridge

If this is your reunion year, a visit to Cambridge for Homecoming is a must (free dormitory rooms for reunion attendees). For all alumni Homecoming in June is a perfect time to visit MIT, to see your friends, and former professors. There will be lecture demonstrations on new areas of research, the annual alumni luncheon, an important panel led by Dr. Killian, all followed by reception, dinner, dancing, and entertainment.

Remember June 16th. Register now using the yellow early registration form included with your 1969 Alumni Ballot, or send \$14.75 per person to the Alumni Association, Room E19-439, MIT, Cambridge 02139.

**REGISTER NOW FOR
MONDAY, JUNE 16, AT MIT**

GEARS

**Designed and
Manufactured to Meet
YOUR
Production Requirements**

Custom Gears Exclusively

DIEFENDORF
GEAR CORPORATION

SYRACUSE, N.Y. 13204

albert

PIPE • VALVES • FITTINGS

**Steel / Wrought Iron / Aluminum
Plastic / Stainless / Alloy**

PIPE FABRICATION From one coded
pressure vessel to complete power plant pre-fabricated piping.

SPEED-LAY Economical pipe system for oil-
gathering, dewatering and chemical processing lines.

PIPE PILING & ACCESSORIES

Composite pile extensions. Non-field welding H-Beam points
and sleeves.



WRITE FOR FREE BROCHURE:

ALBERT PIPE SUPPLY CO., INC.

Manufacturers—Fabricators—Distributors
101 VARICK AVE., BROOKLYN, N. Y. 11237
Telephone: 212 HYacinth 7-4900
S.G. ALBERT '29 • A.E. ALBERT '56

Class Review

late news

of note

95

It is a known fact that '95 made a few records in its day in athletics and in other fields. The record we are establishing now is that two of us remain on Planet Earth still batting it out!—*Andrew W. Fuller*, Secretary, 1284 Beacon Street, Brookline, Mass. 02146

96

At least one member of the class still makes his New Year's Resolutions—and best of all—follows through with them. The following letter was received from *Herbert D. Newell*, 4837 E. Tyler Avenue, Fresno, Calif. 93727. "The last *Technology Review* had an expression of the difficulty of preparing a class report, if the members did not submit information. Here is my contribution. I was 97 years old early last August. For my years, my health seems excellent. I am some wobbly on my feet, hearing fair for ordinary conversation, imperfect in an auditorium. Vision is poor. I can read occasionally without spectacles but generally a reading glass helps. Sometimes I cannot read at all. My son had to prepare income tax last spring and generally reviews business correspondence. I have no dentures.

"I remain generally in my apartment because it is the most comfortable location and has an agreeable outlook. I can putter about the place with hoe and shovel, go through the correct motions and accomplish little. I rate myself as inefficient. The lot is 100 by 300 feet with sundry nut, fruit, and just plain trees on it. A freeze in early 1967 damaged citrus trees and resulted in a rather skimpy yield this season. However some of the fruit is extra large. The larger tangerines are the size of small oranges. The navel oranges had larger fruit approximating a pound each.

"There are two grandchildren. The elder, a girl, is in her third year at Fresno State College. She drives the six miles to her classes in whatever car is most available. Her diversion is riding horseback. Occasionally she competes in riding and sometimes wins a trophy. . . . The boy

Succeeded anyway	'03
A good deed	'12
An honor richly deserved	'15
And who was Aesculapius?	'16
Son may be first man on the moon	'17
Worst athlete but most useful	'18
I.E.E.E. Fellow	'19
Explorers' Club award	'21
To benefit industry	'23
Success story	'24
Has his day	'27
A.S.M.E. honor	'29
Daughter is Presidential Scholar	'30
A.A.A.S. President a cartoonist	'33
Sikorsky Aircraft President	'39
Not for the inadequate	'40
Joins the Nixon cabinet	'42
DNA Researcher	'43
New company formed	'54
Device to aid heart victims	'62
Cogitate	'67
A.E.C. Fellowships	'68

Copy for this issue of *Technology Review* was due from your Secretary about February 15. Information reaching him after that date will be reported in the May issue unless he desires to insert it in the Late News column.

is in third year at high school. Years of piano lessons have brought him to the point that he can earn by playing at a pizza house or private parties. He bowls, works about the place, and has a flair for cooking. Recently he produced a delectable pecan pie and a day or so later a well flavored cake.

"My son is interested in magic. Late last summer he, his wife and son attended a magic convention at Santa Rosa a drive of about 240 miles each way. I went along for the change. Food was satisfactory everywhere and served in air cooled rooms. Drinking water at Santa Rosa was so heavily chlorinated that it was not enjoyable. However, by gulping it down it supplied moisture."—*Clare Driscoll*, Acting Secretary, 129 Walnut St., Brookline, Mass. 02146

98

Walter Page, who spent most of his time with the Class of 1897, took a course with the Class of '98. As I received no reply from him in Wynnewood, Pennsylvania, I wrote to the M.I.T. Club of Delaware Valley. The Secretary, Edward S. Halfmann, answered as follows: "I have attempted to contact Mr. Walter Page '98 but have been unsuccessful. The telephone rings, is listed in the directory but no one answers. The house appears to be empty and one of the neighbors thought they had moved to Florida. I am sorry that I cannot supply you with any definite information."

The courses taken now at M.I.T. number many more than 1898. Then there were only 13, the thirteenth being a general course. Now there are 30 courses, a long list from which to choose, many with modern sounding names. Some of the very new to '98 grads would be Aeronautical Engineering, City Planning, Electrochemical Engineering and Nuclear Engineering. The thirtieth is called Without Course.

No classmates have written lately to—*Mrs. Audrey Jones Jones*, Acting Secretary, 232 Fountain Street, Springfield, Mass. 01108

01

The following letter was received from *Ed H. Davis*. "Your noble act in assuming the 1901 Tech Secretary job seems to include the class Treasuryship as well. I enclose a letter from The First National Bank of Boston, showing an open account and I will leave you to take it from there. That will cover your typing and postage, and any balance that may survive can check out eventually to the 1901 Fund at Tech. "I enclose, too, a letter from the Executor of our late Secretary, *Ted Taft*. Apparently he could not decipher my writing when I sent him your name and address. I sent him a copy of this letter, typed, no less, so he can advise his assistant to send you whatever may be found.

"I am sorry the current *Tech Review* did not list you as I had advised them. Apparently my script failed there, too. I now send them a carbon of this letter. Joy be the consequence. My best to you, Bill."—*William G. Holford*, Secretary, 921 Patterson St., Klamath Falls, Oregon 97601

03

The worst winter snow storm in ten years occurred February 9. It engulfed all traffic and disrupted electric and telephone service for days in the Boston area. This brought back old memories of such hazards, while attending our classes at M.I.T. in Boston. Fortunately we were closely restricted to Rogers, Walker and nearby Trinity Place. How unlike today, when such a distance separates the many campus buildings that house laboratories and the newer courses of atomic and computer research at Cambridge.

Arthur Gibbs, Course VI, of Brockton, Mass., discloses our early source of M.I.T. essentials from an advertisement in *The Tech*. "Drawing boards, papers, inks, pens, instruments and fountain pens at discount rates. A. D. MacLacken, Tech Cooperative Store, 214 Clarendon St., Boston." Not having a recent picture of himself for our class news, he "refrains to be exposed to public view." However, next July 1 is the date of his retirement 17 years ago after 33 years service with the New England Insurance Exchange as Fire Protection Engineer. In closing, his greatest satisfaction to date is being an alumnus of 1903.

Deceased

A sombre note to announce the death of our Dean Emeritus *Andrey Potter's* devoted wife and companion, Eva. I had a memorable visit with them last summer while at my son John's home in Kentucky. I motored up to Lafayette, Ind., and enjoyed dinner with them at their attractive home on the border of the college campus. Andrey also gave me a tour of many campus buildings and his special university office for official consultation.

It is a comfort to Andrey that his distinguished daughter Helen, who attended our 60th with the family, is now Professor of Economics at Purdue after many years at Loyola University; so she is now at home as a companion.

Succeeded anyway

As he promised earlier, *Chas. L. Bates* [see his photograph on page 124] has sent in his autobiography—and a most interesting one it is. "In the summer between junior and senior years, I was a draftsman in the office of the chief engineer of a subsidiary of the New York Central in Cincinnati, J. W. Kitterage. I lasted until August 15, when I had to leave on account of hay fever. (Running eyes and dripping nose are very detrimental to clean and tidy drafting). So after graduation I decided to get out of hay fever country if at all possible. Pro-

fessor Swain, however, had a different idea. The day before graduation I was ordered into his office—where one had to stand at rigid attention—and he told me without preamble that I would report at the engineering office of the Pennsylvania Railroad in Pittsburgh, leaving that night (the day before graduation.) I asked if I might be allowed to say something about this to which he replied, 'No!' However I did reply stating that from my experience with hay fever in Cincinnati the summer before that Pittsburgh would be as bad or worse, that I could not stand it there; that I preferred to go north, possibly Canada, to get away from the pollen laden air of the Central States. His reply was, 'You have heard what I said and if you do not leave tonight for Pittsburgh you need never look to Tech for a recommendation for I will see to it that you do not get it.' So I never got a job through M.I.T. after graduation and have never given them as a reference when applying for work.

"My parents were down for graduation so when they went home to Chicago I went with them. On arrival I applied to Mr. Carter, Chief Engineer of the C. & N. W. railway and asked if he could place me somewhere in his Northern Division till freeze-up as I couldn't work in the south on account of hay fever. He sent me to Escanaba that night to report to the Division Engineer there. After freeze-up when the work closed down, I wrote to Mr. Kitterage to see if he could place me for the winter—which he did. By return mail, he sent me a pass with orders to report to L. S. Rose, Maintenance of Way Engineer at Mattoon. I worked on the Indianapolis—St. Louis Division till the following April. Most of my time was spent directing grade reduction work and work on new yards at Mattoon and East St. Louis—getting ready for the increased traffic to the World's Fair of 1904.

"I left there in the latter part of April heading north till I could see no more ragweed or golden rod growing along the right of way. This took me to Winnipeg, arriving on the evening of April 30. By noon on May 1, 1904, I had four jobs to pick from. I chose one with the Construction Department of the Canadian Pacific Railroad under J. G. Sullivan, Engineer, graduate of Purdue University, a tough Irishman and the finest man I ever worked under. Although the work was intended to be temporary, it did not work out that way. I stayed with the Canadian Pacific in various engineering capacities until June of 1921. Meanwhile, on December 7, 1907 I married *Clare Hager* in Toronto and in January, 1908 received a 'wedding present' from the Chief Engineer—assignment as Assistant Division Engineer at Ft. William in charge of terminal grain elevator construction (a job in town where we could have a home instead of camping in tents). From October 1908 to November, 1909, I was Division Engineer, Maintenance of Way at Ft. William in charge of about 1,100 miles of track, including siding and spurs.

"While Assistant Division Engineer, Construction Department, in charge of location in the winters and grading, track-laying, ballasting, building and bridge construction in summers (November 1909 to January, 1915) between Winnipeg and the Rockies, I had a bad derailment on a 'hurry up' call to go to a wreck. My left leg went between the ties of the skeleton track bending the leg the wrong way and pulling the ligaments badly. I asked for a leave of absence but was told it could not be allowed at that time because of the work load. So I had a telephone put in at the head of my bed and I handled work this way for two months when I first put my foot on the floor. At this time I had six work trains and two steam shovels ballasting 175 miles of track. My left leg shrank to four inches shorter than the right one, so I put on indian mocassins and walked flat footed till it came down to normal length—took about three years. I never was able to get sick leave during this period and my first respite came on January 15, 1915, when all work closed down on account of the war.

"In April of 1920 I returned to C.P.R. as Engineer in charge of foundation for C.P.R. Ocean Service Steam Ships at Vancouver, B.C. The foundation was very bad for a heavy pier (marle of indefinite depth) requiring the excavation of about a million yards of marle and the filling of very coarse gravel (about a million and a half yards). The C.P.R. wished me to return to the Prairie while the fill settled for a year before putting on the superstructure. But such a move would entail winter location. I didn't feel that I was up to anymore of that kind of punishment (sleeping on frozen ground and working in temperatures of 50 degrees below zero!) Most of the work would be travelling on snow shoes and I still had to favor the leg, so I resigned and was given a very good clearance and letter of recommendation.

"From 1912 to 1926 I was Consulting and later Chief Engineer for the Northwestern Dredging Co., of Vancouver and Portland. We specialized in submarine rock excavation and our work extended from Wrangle Narrows in Alaska to the Canadian coast and the Washington coast to and including the Columbia River. (Our dipper dredge operated to a depth of 57 feet and our drill was designed on the principle of the Ingersoll Rand (with their consent but cast in the centre of the drop hammer instead of being bolted to the side, the usual custom.)

"My last 16 active years were spent with P.G.E. (a small single track government-owned road with a big name which ran from Squamish at the head of Howes Sound to Quesnel 348 miles to the north interior—very scenic and mountainous country). Most of its 16- to 18-year-old bridges were of wood construction and many, particularly down at the coast where the winter was mild most of the year, were very badly in need of repair or renewal. When a new board of direc-

tors was appointed by the new B.C. Government, I knew something would have to be done promptly. Their Chief Engineer, an old C.P.R. employee, was not a structural man. So I applied to him for the job and got it. It was rather a nightmare as the bridges were designed for 143-ton locomotives and they were using 168-ton locomotives. By February 1935 we had renewed, replaced or otherwise changed 205 bridges. During my stay on the P.G.E. road we never had a fatal accident due to faulty track or bridge conditions.

"In December of 1943, when getting off the train onto the Quesnel platform I had to run a few steps off its end. The ground was glare ice covered with a few inches of snow. I slipped and in throwing out my hand to save a harder fall, I split the ball in the socket of my left arm. As the company was so poor that I had to handle all the engineering, it required most of my time in inspection by gas car. My gas car required a 90 pound lift on the extension bar to remove it from the rails or to turn it around. My left arm just would not take it, so I was obliged (for the management would not allow me an extra man to travel with me) to have the company doctor certify that I was not physically fit to continue my work allowing me to receive my pension at 64 instead of 65.

"Since I have left the P.G.E., the government has changed to Social Credit. Though I don't agree with their politics, they have certainly made a success of the railway. Work that I had recommended and fought for (and had been turned down on) has gone ahead by leaps and bounds. The total main line was 348 miles in my time. At present it is 1,115 miles with no end in sight for the near future. The line to Vancouver has been connected; the ferry slip at Squamish is being used for a freight car ferry service to Seattle; north Vancouver has been made into the south terminal of the road with a large sorting yard and docks for oriental transfer; the line into the interior has been extended to Fort St. John and is scheduled to extend to Whitehorse; there is a branch to tap Ft. St. James and the Stuart Lake waterways which has opened up tremendous stands of timber and encouraged the establishment of saw mills, pulp mills, etc., where the country formerly had no industries. In closing I wish to make a statement which I have frequently made up here and which was confirmed by one of the vice presidents of the Southern Pacific on an inspection trip over the P.G.E. 'The P.G.E. is the most scenic railway on the North American continent.'

"Upon retirement in June, 1944, my wife and I moved to our cottage on Savary Island where we spent 10 months a year until 1952 when Mrs. Bates had a very severe attack of flu. This resulted in permanent damage to the mastoid and she lost all sense of balance, a condition which lasted until her death August 23, 1960. So endeth the notes on my career. Hope you can read it. Merry Christmas."

Correction

In the last issue we reported that C. M. Joyce invited any classmates traveling in his area to stop by and visit. At that time we were unaware of his new address—The Crescent, Montclair, N.J. 07042—John J. A. Nolan, Secretary and Treasurer, 13 Linden Avenue, Somerville, Mass. 02143

06

There is an old saying that no news is good news. It may be so, but NO NEWS doesn't help a class secretary to make this column more interesting for you—does it? Where have you been lately, or are you just enjoying a quiet life at home? We have recently "enjoyed" a near blizzard that left up to two feet of snow, with winds that hit 40 or more m.p.h. in gusts. Last month I commented on the Wellesley—M.I.T. student interchange. A recent Wellesley College Bulletin had a full page of photos taken during a "preliminary" interchange when 300 Wellesley girls went to M.I.T. and 700 Tech men came out to Wellesley—just for the day I suppose!

We do get some news at times. Bill Sheldon, Course III, sent me a note through the Fund office last May that I finally got in September. In the note he said he "was so sorry to hear of the death of Guy Ruggles. He was a special crony of mine and we did our thesis together." Bill has a winter home in Homestead, Fla., and I believe gets out to his old stamping ground in Alma, Colo., and to Barnstable on the Cape.

Some time ago I had an interesting chat with Frank Benham, Course I, who phoned from his apartment in Arlington. His wife had died in 1952 and they had three daughters and two sons with five grandchildren and two great-grandchildren. Frank quit driving a few years ago but kept his car and gets drivers. A son drives the car to Daytona (Frank's winter home for many years) and he sometimes goes along when Frank moves down in October.

While I was working on these notes yesterday (February 16) Bob Rose, Course XIII, phoned from Marblehead to ask how I was and chat. He and Anne sold their power boat but they still drive. I have quit but Marion gets me around.

Classmates deceased

In the March notes I reported five deaths—careers to follow—and here they are. Arthur Muirson Bellamy, Course V, was with us junior year doing graduate work, having received a B.S. degree in 1903 from Trinity College in Hartford. He was born in 1882 in Dorchester and died October 12, 1968, in Hyannis. His address until the mid-fifties was Jamaica Plain (Boston) while he was active as a civil engineer and surveyor. Before retiring to Dennisport he had also lived in Cambridge. Arthur began his career as a steel chemist in Pittsburgh and worked in the laboratory of Thomas Edison before



Chas. L. Bates, '03 J. M. Burch, Jr., '08

becoming associated with the Army Corps of Engineers. During W.W. II he worked on the Manhattan (bomb) project and later received a citation from Secretary of War Stimson. A mathematician by avocation he had developed a system of cyclical numbers and a new method of factoring based on that system, about which he had planned to publish a treatise. Arthur had been a member of the Appalachian Mountain Club; he was a past officer of the Field and Forest Club and of the Mercantile Library Association, a member of the Senior Citizens of Hyannis, the Cape Cod Duplicate Bridge Club and was an Honorary Member of the Retired Men's Club. He is survived by a daughter Mrs. J. Robert (Ernestine) Choate of Bristol, N.H., where he had summered for forty years and often visited the daughter after she moved there in 1953. Much of the above information comes from an obituary thoughtfully sent to me by Frank Milliken, '04, who lives in Centerville on the Cape. Thanks Frank.

Frederick Worthington Chandler, Course XIII, was born May 10, 1883, in Kansas City, Mo., and died October 20, 1968. This was reported by a son who telephoned the alumni office. Fred had prepared at Newburyport High School; was with our class all four years, and a member of the Naval Archaeological Society. He soon became engaged in shoe manufacturing in Newbury but by 1940 his address was Roxbury then Taunton, and evidently after retiring he had lived in Swampscott. We lack information about his family and other activities and interests.

Ralph Leighton Dyer, Course XIII, died December 31, 1968, probably in Seattle where he had spent most of his life after 16 years or so in Walla Walla as an hydraulic engineer in the firm of Freuler & Dyer. During W.W. I he was a member of the Draft Board and then District Manager U.S. Shipping Board Emergency Fleet Corp., in Seattle. Until retirement in 1967 he had been a sales engineer with several Seattle firms.

Roger Leavitt Rice, Course VII, was born July 31, 1883 in Williamstown, Mass., and died November 22, 1968 in Cleveland, Ohio, I believe. He was with us only

sophomore year and the earliest information about his career goes back to 1913 when he was a contractor in Los Angeles. In 1934 he was in Cleveland as Vice President of Mitchell Herrick & Co. A few years later he was Vice President and Treasurer of Fahey Clark & Co., until he retired.

Arthur Louis Sherman, Course I, was born January 29, 1883, in Foxboro, Mass. and died December 5, 1968, in Winter Park, Fla. This was reported to Sherm Chase by Arthur's brother Walter. He had prepared at the popular Chauncy Hall School in Boston was a member of the C.E. Society and his thesis, with Howard Barnes, was *Tests to Determine the Shearing Strength of Concrete*. Arthur soon joined the Board of Water Supply, City of New York as Assistant Engineer in White Plains and by 1925 was Designing Engineer with the New Jersey District Water Supply Commission in Newark, becoming Deputy Chief Engineer of that State's Water Policy Commission by 1930. A few years later—the Depression Years—he was in Washington, D.C., as Chief Engineer Examiner, P.W.A. However, by 1940 he was back in Jersey City as a Consulting Engineer, then by 1947 was back in Washington as Chief, Management Branch—War Assets Administration. He continued to live in Washington as a consulting engineer. In 1967 I had a long letter from Arthur and received his eight-page bulletin titled "Some Autobiographical Recollections." It's a scream and from it I learned that his father was M.I.T. '77. Arthur had been a welcome correspondent through the years, a loyal classmate, and had attended some of our reunions. His wife died in 1956 and he remarried in 1959 but the second wife died in 1961. The last I heard from Arthur was on the reply envelope of the Alumni Fund in March 1968 which said—Activities (NONE). He was then living in Bethesda, Md.—**Edward B. Rowe**, Secretary-Treasurer, 11 Cushing Road, Wellesley Hills, Mass. 02181

07

The quality of the '07 notes for this month is very poor and very meager. Besides being unable to see so as to read, your Secretary has just recovered from a

three-week siege of intestinal flu and is still very much below par. Also, this past month no one has sent me in any Class information. I have talked with our President, **Don Robbins** and, although his progress toward recovery is slow, it is steady and definite. He hopes that with the spring, and the opportunity to get out of doors more, this improvement will be more rapid.

No answer

The 20th of February your Secretary will be operated on for a cataract in the left eye, and later in the spring the right eye will be treated. The glaucoma is improving slowly under medication, and he hopes by summer to be able to see again and do better with these notes. As of now, no one has answered my appeal and offered to take over these duties. Because of lack of news, I insert the following and trust the personal nature will be forgiven. On January 24, **Phil Walker** retired as teacher of a Married Couples' Bible Class at the United Presbyterian Church of Whitinsville, Mass. He had taught this class for forty-eight consecutive years, starting in 1920. At one time, the class had a membership of over fifty couples. At present the membership is over twenty-five couples. Phil and Anne were presented with a large Paul Revere bowl suitably inscribed for the occasion, and Phil was elected "teacher emeritus." Anne was presented with a large bouquet of yellow sweetheart roses. On January 26, the Walkers hoped to celebrate their 59th wedding anniversary, but Phil's sickness prevented this.

Otis G. Fales, Course II, has been elected Chairman of the Board of Gregg Co., Ltd., of Hackensack, N.J.—**Philip B. Walker**, Secretary-Treasurer, 18 Summit Street, Whitinsville, Mass. 01588; **Gardner S. Gould**, Assistant Secretary, 409 Highland Street, Newtonville, Mass. 02160

08

We are sorry to report the death of **Jimmie Burch** on January 14, 1969. The following newspaper account will be of interest. "Mr. Burch was born in Nece-dah, Wis., and lived here [Dubuque] most of his lifetime. In 1913 he married Marie Rider, who survives.

"He was a member of Masonic orders, The Jesters, Elks, M.W.A., and the Dubuque Golf and Country Club.

"He was a 1908 graduate of the Massachusetts Institute of Technology and was active in its alumni activities. Mr. Burch was also past president and past chairman of the Board of The Dubuque Bank & Trust Co.; past president of Midwest Lumber Co., and Robert's Sash and Door Co. of Chicago, The Loetscher Burch Co. of Des Moines, the Farley and Loetscher Co. of Sioux Falls, S.D., and of the Key City Gas Co.

"He was president of the Linwood Cemetery Association and the Mount Pleasant Home Association.

"Also surviving are a daughter, Mrs. Mary June Patton of Wilmette, Ill.; four grandchildren, a great-grandchild, a sister Mrs. A. T. (Louise) Peaslee of Espanola, N.M., and nieces and nephews." Jimmie was a booster for '08 and usually came to all reunions. We will miss him.—H. *Leston Carter*, Secretary, 14 Roslyn Road, Waban 02168; *Joseph W. Wattles*, 3d, Treasurer, Box 421 Casey Key Road, Route 1, Nokomis, Fla. 33555

11

Ormond R. Bean of 2545 Terwillinger Blvd., Portland, Ore., sent along the following account of his professional activities: "University of Oregon—Bachelor of Science degree, civil engineering, Class of 1909. M.I.T.—Special in Architecture. Practiced architecture 1910-1933, 1946-1949. Member of architectural firm of Lawrence, Holford, Allyn & Bean 1914-1933 (Lawrence and Holford M.I.T. graduates). October 1918 to August 1919 Assistant to City Planning Consultant, Charles H. Cheney, in preparing a housing survey and a zoning code for Portland. President of Oregon Chapter, American Institute of Architects, two terms 1925 to 1927; Director and Treasurer for five years. Chairman of Portland City Club Planning Section 1927. Appointed by governor of Oregon, 1929, to prepare a State Building Code.

"Secretary, Sons and Daughters of Ore-

gon Pioneers, 1939; Director 1935 to 1943; President 1948 and 1960. City Commissioner of Portland, Department of Public Works July, 1933 to June, 1939. (Resigned to become Public Utilities Commissioner of Oregon). City Commissioner of Portland, Department of Finance, January 1949 to December 1966. Then Contract Consultant to the City Council during 1967. Oregon State Planning Board, 1934 to 1939; Chairman 1935 to 1939. Northwest Regional Planning Board 1935 to 1939. President, League of Oregon Cities, 1934 and 1935; Director 1933 to 1939, and 1954 to 1957. Director, Museum of Natural History, 1938. Director of Museum of Science and Industry, 1949 to date. Public Utilities Commissioner of Oregon June 1939 to June 1943.

"Regional Director of Transportation, Territory of Hawaii at Honolulu, for the Office of Defence Transportation, July 1943 to 1944. Regional Director of Transportation, Territory of Puerto Rico at San Juan, for the Office of Defence Transportation, July 1944 to December, 1944. Director of Transport for the Middle East Supply Center covering sixteen middle east countries with headquarters at Cairo, Egypt, December 1944 to March 1946, for the State Department in the Auxiliary Foreign Service attached to the Cairo legation. Appointed by the governor to the State Centennial Commission, 1948. Secretary-Treasurer, Portland Summer Band Concert Association, 1949 to date. Appointed by the governor of Oregon as chairman of Legislative Interim Committee on Local Government, June, 1955 to January, 1957. Member of Executive Board of the Municipal Finance Officers Association, June 1957 to June 1960.

"Member Kiwanis, Maccabee, Mason, Woodman, Eagles, City Club, Oregon Building Congress, Multnomath Athletic Club, Oregon Historical Society, Russellville Grange, Portland Zoo Commission, National Finance Officers Association of the United States and Canada, Oregon Museum of Science and Industry, Oregon Foreign Travel Club, Knife and Fork Club and Lang Syne Society."

I just received word of the death on last November 4, of *Joseph Gershberg* in Inglewood, Calif.

A recent letter from *Minot Dennet* enclosed a leaflet with several pictures of Villa Capri Apartments, 2951 S. Bayshore Drive, Coconut Grove, Fla. 33133. From the pictures this high rise apartment is beautiful and has everything anyone could want. Minot moved into apartment J-2 overlooking Sailboat Bay recently. He likes it very much and thinks it is his last move. I wish a lot more would follow Minot's example and write to Obie, particularly if you tell of what you are doing. We can even stand a little bragging.—*Oberlin S. Clark*, Secretary, 50 Leonard Road, North Weymouth, Mass. 02191

12

DO YOU REMEMBER the trips we used to take by train to Riverside with a gal from Wellesley, Wheaton, Simmons or LaSalle to go canoeing on the Charles River? Sometimes, a group of several canoes would tie together and float down stream, and often someone would have a hand-wound phonograph, equipped with a morning-glory horn, which would be playing continuously.

Belatedly, we acknowledge Christmas cards and letters from *Jim Cook*, *Billy Reeves*, *Hugo Hanson*, *Jay Pratt*, *Harold Mabbott*, *Arch Eicher*, *Harold Manning*, *Randall Cremer* and *Cy Springall*. Cy tells about a trip he and Marjorie took last summer to the British Isles. They enjoyed a jolly week with Cy's two cousins and their families near Edinburgh after visiting in Shannon, Killarney and Dublin. Then another week in London and down to Plymouth to see other relatives, followed by a tour through the southern and lake districts. I quote from Cy's story of the loss and return of a favorite old Guidebook.

Lost and found

"Before leaving home we looked over many guidebooks and chose a very factual one to bring us up to date. However, we decided that Clara Laughlin's *So You Are Going to England*, which we had used in England in 1928, was still tops on historical background. So it went along and occupied a prominent place on Marjorie's lap. One day our route called for a ferry trip over the River Humber. We crossed and were approach-

ing Lincoln, when Marjorie thought to obtain background material. But no 'Clara' could be found. Alas, it would take too long to retrace our steps so we sorrowfully continued on our way. Marjorie knew there was no address to encourage return of the book. However, she soon began to have a feeling that she would see it again, though she had no idea how this would come about. She was convinced, however, that it had fallen into the hands of some thoughtful person and that he would find a way.

"A few days after our return a phone call announced the fact that the book had arrived at my son's home. It seems that an envelope addressed to him had been found in the book. Yes, Marjorie was right. 'Clara' had been picked up on the ferry landing by that thoughtful person, who shared our belief that the book, though ancient, was still valuable, and might be cherished by us. We have had a delightful correspondence since then, and hope to welcome Mike and Jim Wharton to Andover some day. Was that ESP?" The Springalls are now in Scottsdale, Arizona and repeat their invitation to visit them at 325 West Fourth St., if any classmates are out that way this spring.

Career

Phil Jones has sent in an interesting review of his activities. On graduation in 1912, he joined the engineering department of Swift and Company in Chicago, but left after six months to accept a position in Brazil with Sao Paulo Tramway, Light and Power Co., first as superintendent of their hydroelectric plant at Parnahybe, and then as assistant superintendent of power in Sao Paulo. In July 1913, he married Elizabeth S. Burke, University of Chicago, 1913, who came to Sao Paulo for the ceremony, held in the Sao Bento Cathedral. The following spring she returned to the States to give birth to a daughter. There were complications, and Phil returned to be with her the following year. Due to World War I he was unable to return to Brazil, and joined the engineering firm of Jackson and Moreland in Boston where for about a year he was engaged in inventory and appraisal work at the Philadelphia Electric Co., and then at the Public Service Corporation of New Jersey. In March, 1916, he joined the engineering department of the Goodyear Tire and Rubber Co., in Akron, Ohio, with whom he was connected for eleven years, first in Akron and then three years in Los Angeles, where he supervised the erection of a new plant.

In 1922, he returned to the main plant in Akron as Chief Electrical Engineer. While with Goodyear he published articles in electrical engineering magazines throughout the country. In May, 1927, Phil joined the technical staff of Bell Telephone Laboratories, the year after it was organized. Here he was engaged in editing and ghost writing, later becoming Editor of the *Record* and then Editor of the *Bell System Technical Journal*. He retired in 1953, at which time he had just

been elected Mayor of Northport, Long Island, N.Y., an office in which he served until retirement in 1959 when he moved to Naples, Fla. Phil had two children, and his son, Chapin, is still living in Cincinnati. His wife, Elizabeth, died in 1966 and his daughter the previous year. Phil now lives alone in Naples, and is in very good health, enjoying his daily walks and swims along the nearby beach. He has always been interested in philosophy and has published a number of articles in the *Philosophy of Science* quarterly as well as in the British quarterly *Mind*. He also published a book, *The Nature of Knowledge*, in 1964.

A good deed

We think Larry Cummings may well become another covered bridge fan, joining the Mannings and the Wilsons in this rewarding hobby. He writes that he and Julie attended the Parke County Covered Bridge Festival in Rockville, Ind., last fall and that they greatly enjoyed the many events, as well as visits to a number of covered bridges. However, they chose Sunday for the trip and the traffic was terrific. The attendance at the Fair was easily ten times the normal population of this small town. They tell an interesting story of traffic along a back street which many including Larry, mistakenly thought would avoid the congestion. A three block jam developed back from the entrance to the main highway. After a long wait, a middle-aged man got out of this car, leaving his wife to drive, and walked to the highway junction, where he stopped and began to direct traffic with the air of one who was accustomed to the job. Soon traffic was moving most smoothly in all directions, and when his own car reached him, he got in and departed with the deep gratitude of many motorists for his good deed.

Classmates deceased

We regret to report the death of Arthur Lennon on June 27, 1968. Arthur lived in Jamaica Plain all his life. He was with us for but two years as a chemistry special. Theodore Kalbfleisch also passed away in Glen Falls, N.Y., on November 18. He spent three years with the class in Course VI.

Choose another rut

Here is a contribution from Dave Guy, a long time resident of Washington, D.C., which begins with his arrival as a freshman at the Old South Station in Boston. "I took off up Summer Street and down Washington in search of Scollay Square. This was the beginning of the most bewildering, depressing, and frustrating week of my whole life. Never had I seen a Boston 'square' before, but I pictured a small rectangular park, maybe with a statue of a Puritan in the center. I recall now only cobblestones, the Parker House, and a roofed-over doorway into a rumbling subway underneath. The cop who directed me to Scollay Square had my gratitude for I did get to the Institute. After two or three days of footwork trying to become oriented and get a bit of Tech in my mind's eye, I broke down with an

attack of hopeless homesickness. I was ready to pack my grip for home. I had arrived early intentionally, and had located room and board 'close in' on that well known St. Botolph Street. It was here one evening that Harry Ferguson, having observed my heaviness of heart, introduced himself and proposed that we dine together. At last I had met a classmate, one who radiated fellowship and knew his way around. Through Harry I met Jesse Hakes and John Pettingell with some others that were living at the same address, and I snapped at the chance to join them. This was the beginning of life-long friendships. Harry passed away some years ago. Jesse Hakes, Donald McCormack and I, together with our wives, were guests at John's home in Acton, Mass., for the glorious 50th reunion in 1962.

"In summers at Tech I worked for the Boston Elevated. As I recall, it was controlled by Stone and Webster. One day on a surface line survey job, the chief, a good handbook engineer, was at the chain's end with notebook in hand, and guessing at the center of a manhole, asked me to swing an arc to the curb and give him the distance to the nearest hundredth of an inch. I remarked that he could not estimate the center of that manhole to the nearest tenth of an inch. But noting his reaction, I quickly did as I was told. I think these two episodes foreshadowed what my first move after graduation would be. I wanted to get back home, and Stone and Webster was building a dam near Portland, Ore., about 100 miles from Chehalis, Wash., where I grew up. After visiting my family, I went to Portland, intending to stay at the YMCA and look around. Upon entering the 'Y,' I noted a Stone and Webster poster offering a job as a blueprint boy. I went to the telephone and got the job. A week later I was a draftsman. Soon, that job was completed and several of us went to another Stone and Webster job on Big Creek, Calif. Allegedly due to the imminence of the war, the project shut down, releasing 150 engineers. Two of us, however, stayed on to clean up some office work after which we secured jobs with the Willamette Iron and Steel Works in Portland, Ore.

"Then in December, 1913, the president of Whitworth College, my alma mater, asked me to take over the math department, which I did, with some hesitation. However, I found that teaching was different—I liked it. Here I was out of the woods, back on the college campus, young people, co-eds, and all that, plus the fact that the college soon relocated in Spokane where I had a three part job—math professor, football coach and proctor of the men's dorm. But war was declared in April, 1917, closing down the college and I went to Washington, D.C., as an engineer with the U.S. Geological Survey, joining the national search for low-cost hydro-power for nitrogen fixation. The search was ended abruptly by using the catalytic proclivity of coal. The Federal Water Power Act of 1920 pro-

vided for but one paid secretary, and engineers were to be assigned by War, Interior, and Agriculture. I was one of two selected from Interior's Geological Survey. I resigned from the Power Commission in 1927 to become manager of the National Resources Department of the U.S. Chamber of Commerce. Here I earned a twenty-five-year service pin before retiring in 1951 at age 65.

Meanwhile we (I married the pick of the college girls in 1916) had grown to be members of the 'older inhabitants' of Washington. We had become engrossed in the city's civic affairs—my wife in piano teaching and music organization activities and I in church work, hiking and professional club management. My philosophy about retirement is 'Don't stop working; choose another rut.' Long a member of the Cosmos Club in Washington, I was active on its House Committee when the club bought and moved from Lafayette Park to a magnificent residence on Massachusetts Avenue. The club manager resigned and I finally agreed to take the job of 'Executive' which I kept for eight years until 1960. The work and associations here I count among the top experiences of my life. Finally, brethren, after leaving the club business, I became Director of the Columbia (D.C.) Historical Society. In September 1963, due apparently to climbing too many stairs and ladders, a coronary did me in. Now, five years later, the old pump seems to have grown new gaskets and, except for mountain climbing, I am ready to run the whole course over again."

A tough life

Jay Pratt and Priscilla left after New Year's for their annual trip to Mexico, where they have wintered for many years. A typical day at Acapulco includes breakfast at nine, following an early swim in the ocean; then a sun bath in a private cove with friends; a light lunch; afternoon siesta and then cocktails and dinner about 8 o'clock, and early to bed. A tough life! They plan to stay in Acapulco about a month followed by two weeks each in Cuernavaca, Oaxaca and Juarez. Then they will visit Scottsdale, Ariz., leaving for home the end of March.

We hope soon to visit Hugo Hanson, Jack Lenaerts, Paul Tyler and Larry Cummings, all of whom are living near us this winter on Florida's west coast.—Ray Wilson, Secretary, 304 Park Avenue, Swarthmore, Pa. 19081; Jay Pratt, Assistant Secretary, 937 Fair Oaks Avenue, Oak Park, Ill. 60302

13

Back on the "firing line" again (as well as can be expected at our age). There have been several changes during the past year which concern your Secretary, namely: the appointment of Miss Brenda Kelley to the staff of *Technology Review* as the principal secretary of class notes

(believe me she is one of the greatest improvements as far as the *Review* is concerned); Mr. Panos Spiliakos, '66, was appointed Assistant Secretary of the Alumni Association (he has already been of great assistance to your Secretary). Again, we must record the rather sad news as well as the good, for on January 1, 1969, Miss Ruth King resigned as Associate Editor of the *Review*. Ruth had served in many capacities with the alumni Association for over 42 years. The Capen Family participated in a reception for Miss King together with nearly 200 friends. The reception was followed by a "Dutch" dinner. We were the guests of the John Pfeils; we enjoyed our hosts.

Again, your Secretary has been honored by being appointed a member of the Advisory Alumni Council of the Alumni Association. The Council and guests meet generally on the last Monday night of the month at the Faculty Club. This is a highlight of M.I.T. events during the year. Charles Thompson has been a member for many years. Over 150 members and guests participate and learn first hand of present activities as well as the future plans of M.I.T.'s Administration. We would be very happy to have any of our classmates, who would like to, join us at these meetings.

Replies on reunion

Again, it is gratifying to hear from so many of our friends and classmates. Geoffrey Rollanson reports for the 1972 reunion "??"; a reunion in 1970 "If able. Hope you are both in good shape. We expect to see you both at the next reunion. Best regards to you and Marge." John W. B. Ladd states: "Still in Florida and at 80 years old, I do not travel much." From Samuel Knight: "Merry Christmas, Phil." Edward Hurst writes: "Would like to see you ever so much." We have been in ill health for some months, but when the good weather arrives in the spring, we shall surely call on you. George Bakeman reports: "I am sorry not to have seen you (March 1968). I intended to attend the class reunion but was held up and only made my annual New England trip this autumn. Still plugging along here with only a minimum of aches and pains." Warren Gentner states: "Thanks for the up-dated Class Register. Congratulations on a job well done. The number is thinning out. How are you, Phil?"

Leroy Block writes: "Sorry I haven't been able to get in your area to see you and maybe some of other fellows." William Horesh records: "Too early to state but congratulations on the efficient job you are doing for the class. Best regards—Jack." It was nice to hear from Gilbert Parry. We are very sorry that your good wife is ill and we hope for a speedy recovery. Stanley Hodgman replies: "Not likely that I could attend [a reunion]. Sorry."

William Bill Mattson always writes very interesting letters as: "So they didn't accept my resignation as class Vice Presi-

dent. A very nice compliment but still think our class officers should live in or near Boston. But if I can be of any help, please call on me. Also, thanks for reading my note to the Class at the Banquet. Sorry I couldn't be there to deliver it. I told you why I couldn't make it this year. Jo and I have had a very busy and interesting summer and fall. We took an extensive trip to Alaska. We flew to Anchorage with a stopover in Seattle; then by train to Fairbanks, followed by a Flight to Katzebue and Nome. Returned to Fairbanks and next day started a 600-mile trip by bus on the Alcan Highway to Whitehorse. Then a beautiful trip through the mountains via a narrow gauge train to Skagway. There we boarded the *Polar Star*, an excellent cruise ship for a four-day sail to Vancouver. Stayed there several days also visited Victoria. On the flight back to Denver, stopped off at Salt Lake City to celebrate our wedding anniversary with the Reverend George Davis who married us ten years ago. Janet and Frank flew from San Francisco for the celebration. We were away for a month. As soon as we got home and after entertaining house guests for two weeks, I picked up my Republican duties in my Precinct." Well, boys and girls, more next month.—George Philip Capen, Secretary and Treasurer, 60 Everett Street, Canton, Mass. 02021

14

We have a belated notice of the death of Dwight J. Stump who passed away October 17, 1965. He was a Course II man and evidently left before graduation. The Class extends its sympathy to Mrs. Stump.

There are more recent deaths to report: Perley E. Conner, La Jolla, Calif. 92037, died on April 6, 1968. He had lived in La Jolla since 1946. Previously he had lived in Illinois where he worked for the Chicago Sanitary District.

Harry J. Baker of Avon Park, Fla., died May 10, 1968. Our records indicated that he was associated with the Edison Electric Illuminating Company in Boston for most of his life until he moved to Florida in 1961.

From Albert F. Hill, Jr., we have learned that his father, Albert F. Hill, 347 Sherwood, Redlands, Calif. 92373, died on July 24, 1968. He had been in the metal business there since graduation.

Roswell Howard Annin, 1305 Warwick Rd., San Francisco, Calif., died September 4, 1968. After graduation he spent a short time as designing engineer with the Aberthan Construction Co., in Boston. Later he moved to California and was engaged in architectural work in Los Angeles.

Frank L. Ahern, 5408 41st St. N.W., Washington, D.C., died July 3, 1967. His early professional life was spent with

Stone and Webster and he lived in Lynn, Mass. Later he moved to Washington where he had a position with the Department of Interior, National Park Service.

Changes of address

Fay W. Williams, 70 Chestnut St., Springfield, Mass. 01103; Leon R. Abbott, 11721 E. Beverly Dr., Whittier, Calif. 00601; Gabriel Harris, 2243 Calais Dr., Miami Beach, Fla. 33141; Louis D. Charm, 7813 W. Normandy St., Miramar, Fla. 33023; Thorn Dickinson, Bradley's, St. Huberts, New York 12943.

If you have not already done so it is not too late to sign up for the reunion festivities. You have already received the outline of programs which should not be too strenuous, particularly since most of the time we can be on campus meeting old friends—Herman A. Affel, Rome, RFD 2, Oakland, Maine 04963

15

It's sad to report the loss of another popular Classmate. After six tough weeks in a Boston hospital, following severe heart surgery for a ruptured aneurysm in the main aorta, Jac Sindler passed away on December 25. He entered the Institute in 1913 from the famous Baltimore Technical High School, where he obtained advanced credits so that he could take a number of Course X subjects with us and thereby developed a social association with our Class, although he actually received his degree in 1917.

Early in the summer of 1917, he became one of the first and original officers in Bradley Dewey's Chemical Warfare Service and contributed a good deal to the development of absorbent charcoal used in those World War I gas masks. After the service, he went with Mitch Kaufman's Hodgman Rubber Co., Framingham to design a solvent recovery system, later becoming Technical Director for Converse Rubber Co., Malden. In 1932 he organized Spirit-Inc., Malden, which he developed into a very successful business manufacturing plastic cocktail novelties, which you've no doubt seen in many public places. Many will remember the attractive sterling inlaid red plastic bowl he gave us at our Forty-fifth Reunion.

He lived alone in one of those old brownstone front houses on Beacon Street, so outstanding in our Back Bay days, which he had modernized. Many of us enjoyed his generous hospitality in his comfortable old apartment. He attended all our Boston dinners and Five Year Reunions and supported our Class generously. A great guy—we'll all miss him.

Friendly reminders

Just a couple of friendly reminders. If you haven't already paid your Class Dues just stick your check in the postage paid envelope. Many thanks. And, remember the New York City dinner at The Chemists' Club there on April 18.

An honor richly deserved

On November 17, Ed Kingsbury received the high award described in this Keene State College announcement. Congratulations, Ed, on this outstanding honor, which you richly deserve. "As the first recipient of a Granite State Award by Keene State College, Edward Joslin Kingsbury of Keene sets a high standard for others to follow. It might be said that Mr. Kingsbury's career has moved from a small corner of a factory to a place in many persons' hearts through his leadership in industry and his many charitable interests. A native of Keene, Mr. Kingsbury graduated from Massachusetts Institute of Technology in 1915 and immediately entered the family's toy manufacturing business here. But his interest was more in the designing and production of machines to manufacture toys rather than in the toys themselves. He was given a small corner of the factory from which to work on his projects. Within two years, he had developed a drilling machine to facilitate the making of metal toys. In 1920, a machine tool department was begun. In 1926, the department became a division of the toy company. And in 1928 the Kingsbury Toy Company became the Kingsbury Machine Tool Corp. It has been a leader in the industry ever since and today is considered one of the most progressive firms in New England.

"Mr. Kingsbury, still a director of the company at the age of 75, retired as chairman of the board in 1964 after spearheading a reorganization of the firm. He was president of the company until 1955. Under Mr. Kingsbury's leadership, the Kingsbury company has been a pioneer and pace setter in community service, furnishing financial assistance to many projects through its charitable foundation, the Kingsbury Fund. Work in this area has included a gift to purchase a new YMCA building, purchase of a new senior citizens center, gifts to the Salvation Army building program, leadership and gifts to spark the new Ashuelot Park in Keene, and financial and leadership assistance to Keene High School and Monadnock Regional High School for their industrial education and reading programs. In 1967, Mr. Kingsbury offered his house and land on Upper Court Street as a gift to the Elliot Community Hospital. The hospital will rebuild on this property. Granite State Awards are made by Keene State College, the University of New Hampshire and Plymouth State College to honor New Hampshire citizens of outstanding stature in their communities."

In brief

In the September, 1968, issue of the *I.E.E.E. Transactions on Industry and General Applications*, Phil Alger had a very learned article on "Speed Control of Wound Rotor Motors with SCRs and Saturistors."

While visiting his family here at Christmas time, Joe Livermore phoned and I was glad to talk with him. And Dix Proctor, the devoted 1917 Secretary, spent an

evening here with Fran and me. He and Vi were to leave shortly on another long freighter cruise. It sounds like '17 has the same fine old friendly spirit as in our Class Supreme. . . . After some major surgery, Kenneth Roy reports he is up and around. Good cheer to him for a complete recovery. . . . The 55 Christmas cards we received from our Class, included 15 from widows and families of classmates, including Alice Anderson, Cynthia Blodgett, Alice Chellman, Virginia (Thomas) Johnston, Tess Hilton, Darthea (MacBride) Wagner, the Peter Murphys with Lucille and Harry's six grandchildren, Ruthie (Place) Hickey, Margaret Runels, Mary Scully, May Sheils and her family, Mollie Swift and Barbara Thomas. These cards and sentiments show the far reaching and continued interest these families feel in our Class.

Our long distance card came in Spanish, from Camela and Gustavo Gross, 1950, in Guayquil, Ecuador. . . . Harold Dodge, the work-horse 1916 Secretary, sent me his original pen and ink rendering of an old German wood-cut. All very touching to us. We quote from some of the Christmas cards. Doug and Elizabeth Baker: "We are quite snug and comfortable in our little house and feel we did the right thing to move when we did. Douglas is increasingly ill but his spirit is magnificent and we are all very proud of him. Several of our children and grand-children will be here with us at Christmas—including our two tiny great-grandsons." Beulah and Earle Brown: "We are looking forward to 1970 to have another good visit with you all. Keep up your good work." Marjory and Whit Brown: "Here we are back in Bradenton, Florida, but so far we've had lots of cold and wind and only one swim. But, we are well and that is really something when you look around down here." (Not a good plug for Florida eh!)

A pretty picture from Wayne Bradley, our host at Moosilauke Inn last summer. From Jack Dalton—"To M.I.T.'s greatest Class Secretary and his gracious helper." Many thanks, Jack, from Fran and me. I am afraid to write anything back to Henry Daley. "I hope this finds you both well, Azel. See by the Review notes that that "Class Supreme" is still very much alive and kicking, mainly due to the time and zeal you put into it, Azel. We are both holding our own physically, no better and no worse. Just getting older, that's all. Our best to Fran and her reprobate husband." Helen Hilbert wrote—"Otto is in the hospital with a mild heart attack and has shocked everyone. He is coming along well but will have to be quiet for a while and, as the doctor said, at last realize he isn't a young man. We had a wonderful 50th anniversary this summer. Our Christmas will be a quiet one." Our best wishes to Otto for a speedy and complete recovery.

Ken Johnson wrote that Ester had been laid up a long time with a shattered femur due to a fall; our best to her. They have had more than their share of tough luck. . . . Marion and Vince Maconi will

be golfing in Florida this winter, while Helen and *Boots Malone* are in Sarasota. Virginia and *Hank Marion* are at Tucson. . . . Bee Norton's original card shows their Dachshund pulling a red ribbon out of a holly wreath on their front door. . . . *Ben Neal's* chiding is directed at me for spoiling his good hospitality with ginger ale. "Would I ever like to see a warm summer's night around here (Lockport, N.Y.). It's 10° above right now, but it will not be long until Cushing's (Maine) again. Everything goes at Christmas, so have fun with Jack Daniels and ginger ale, Ugh!"

Al Sampson's unusual card is a delicate, fine silk print, done in Milan, Italy, of a Chinese painting of The Annunciation—most unusual. A big pretty card from Rear Admiral *Bill Smith*. *Ray Stringfield* doesn't do himself justice: "Your old classmate is getting kind of creaky in the knees with a little arthritis, but still doesn't know enough to stop working. We go up in the redwoods in the summer, to our cabin at Desert Hot Springs for weekends in the winter, and I tell Margaret she is really quite remarkable to have been married only 7½ years and to have three children and 12 grandchildren and one great-grandson. And then she figured any old thing was better than teaching school. As they say, a girl will make a lot of fuss about nothing, and then marry him. Take care of yourselves and we'd love to see you both out here again."

Bur and *Joanne Swain* refer to the gay sailing parties they used to attend on board to help us sail away. But the cruise he refers to this year had to be cancelled because of the New York City dock strike. "Another cruise coming up? South of the Equator again, maybe, have a swell time. Joan and I will lift one to you both at sea. Good health and no friction. All happiness and pleasure to both of you." *Charlotte Wood* was back in good health to be able to enjoy the holidays with Pop in Peterboro, N. H. *Louie* and *Pearl Zepfler* get in a plug for Tucson with Christmas greetings from the land of the Turquoise Sun. Ah, me! And, the *Technology Review* remembered us hard toiling, unpaid, Class Secretaries with an unusual card, personally signed by the Editor and his staff. Many thanks to them. These cards warmed our hearts with their friendly messages.

Classmates deceased

Clarence Hansen passed away suddenly on December 23, in Watertown, Mass., and *Henry Daley* sent me a notice from the Philadelphia *Evening Bulletin* that *Henry E. Rossell* died on January 6, in Gainesville, Ga. He was a graduate of the U.S. Naval Academy and at one time was Professor of Naval Construction at M.I.T. The sympathy of our Class goes to the families of these two men.—*Azel W. Mack*, 100 Memorial Drive, Cambridge, Mass. 02142

How about that word "doing" and the way Henry Wadsworth Longfellow handles it in his *Psalm of Life*: "Let us, then, be up and doing, With a heart for any fate; Still achieving, still pursuing, Learn to labor and to wait." Doing—that's what brings on the feeling of accomplishment, that's what makes any day worth while, whether it is traipsing off to other lands (like the *Joel Connollys*, *Rudi Gruber*, *Victor Dunbar*, the *Bill Leaches*, the *Don Websters*, the *Irv McDaniels*, the *Merrick Monroes*, the *Ralph Fletchers*, and others), or just clearing off your desk or fixing that darn screen door for Mommy.

As our 53rd reunion seems to be approaching, our ever-doing president *Ralph Fletcher* (now, in February, skiing in Switzerland) says the only "doing" required is for you to get to the Chatham Bars Inn—you won't have to do a thing when you get there unless you want to, for the sunshine, the salt breezes, the comfortable chairs on the lawn facing the sea at Cottage G, and the infectious do-you-remember-when exchanges with others who can't forget the Tech on Boylston Street, will give you and yours a sense of well-being that is hard to duplicate anywhere else. So set aside those days, says *Ralph*—June 13 to 15, at the Chatham Bars Inn, Chatham, Cape Cod, Mass., where we have had so many wonderful get-togethers over the years. And look forward with us to some rather special younger companions at the Inn—the Class of 1919, on its 50th anniversary celebration!

Urbanite's dream

Victor Dunbar of Hanover, N.H., gives us a colorful word picture of the intense, quiet, wilderness beauty of a far-off very-northerly place in Nova Scotia, Cape North (see your atlas), where he and his son Donald, an Associate Professor of Psychology at Simmons College, have a wonderful old homestead in a setting that urbanites dream of. Let him tell you: "In Sunrise Valley, we are away from contention and commotion, all is peaceful and quiet. We can hear the gentle rustle of the leaves in the apple trees. We can see the shadows of fleecy clouds on the mountains. The distributing clamor of traffic, the nauseating fumes from autos and factories are far away. We are alone with Nature, with mountains, with rivers, with lakes and ponds and the Wilderness all around.

"The ninety-odd year old farm house is in a 106-acre lot surrounded by fields and woods, down a three-eighths mile road from traffic on Cabot Trail. Looking north, one sees the uninhabited North Mountain Range. And beyond is wilderness. A plateau studded with peaks 1,500 feet high mingles with many rivers and ponds extending to Cape St. Lawrence Light House. This most northern point of Cape Breton

may be reached on the east by foot or wagon or jeep over the final few miles from a settlement called Meat Cove. However, few travelers try to go nearer than to the little village called Capstick on St. Lawrence Bay, which connects the town of Cape North over a spectacular 12-mile dirt road with steep mountains on the west side, and with the ocean straight down a 100-plus feet below. Except by boat there is no other way to the St. Lawrence Light House as there is no road on the west, or Gulf of St. Lawrence side, of the wilderness area.

"The drive entrance to the Dunbar Homestead is on the north section of the oblong shaped Cabot Trail. As a trip to Nova Scotia is not complete without a ride over the 185-mile Cabot Trail, one of the most scenic marine drives in North America, when you do come up this way Donald and I hope you will visit us. Cape North, with a population of about 200, has a post office, a general store, a garage, a small restaurant, and is the home of the Pastor of the four churches of the North Highlands Pastoral of the United Church of Canada. . . . The neighbors for miles around are fine, honest, helpful people, perhaps because there are so few of them that have to help each other, and they extend this friendship to the few summer residents." *Victor* says that after seven years, he resigned from his retired-man's job, "mostly because three weeks vacation did not give me time to go anywhere without rushing back home." He tells us that years ago, his father each year said that next year he was going to Scotland, but "next year" never came. So this year *Victor* himself said he would go somewhere as long as his legs would hold him up. We were glad to get a telephone call from him in New York in mid-January as he was about to board ship for a "real tour" abroad. May it be a fine cruise, *Victor*!

Reliable correspondent

Dave Patten is one of our good reliables when we ask for penned contributions to our "amanuensistical" outpourings and this time we present one or two of his "random thoughts." For these, he supplies titles, as you will now see: "Nixon. Another presidential election has temporarily engulfed the nation. The national life of the people, their spiritual force, and their material organization in laws, constitutions and institutions, have been in the forefront of the national thought. This is the domain of politics, one aspect of which is that of political detail, the tactics of particular policies, and the machinery of methods and measures where opinions quite naturally differ, parties arise, sharp discussions and grave dissensions ensue; the other is of that great whole, the vital principles, the moral convictions and purposes, the guiding ideals of a peoples' life and movement, not alone in our own nation. 'We are, in our distant hope, One with all the great and wise: Comrades, do not

turn or grope For some lesser light that dies.'"

And here is Dave's second random thought: "Czechoslovakia. How many of the Class have ever heard of the Captive Nations Law (Public Law 86-90) passed unanimously by both Houses of Congress in July 1959 and of which Nikita Khrushchev said: 'This resolution stinks.' Nevertheless it is a vibrant part of living history, and authorizes and requests the President to issue a proclamation designating the third week in July as 'Captive Nations Week'; and to continue to do so henceforth until all the captive nations of the world achieve freedom and independence; and there are more than 15 of them."

Classmates deceased

We are very sorry to report the death of Wesley H. Blank on January 9 in a Charlottesville, Va., hospital. George Maverick understands that Wesley was quite well until a day or two before his death, and says he talked with Wesley and Mary on December 31 when all was fine. In World War I, Wesley served in the Army, attended the famous Ecole de Cavalerie in Saumur, France and later was commissioned a 2nd Lieutenant in Anti-Aircraft Artillery. In World War II he was engaged in war work in Washington, D.C., first with the Petroleum Administration and later with the Corps of Engineers. With Stone and Webster before and after World War II he specialized in major structural engineering projects covering a broad field—industrial, housing, bridges, petroleum refineries, TNT plants.

He taught at the Engineering School of the University of Virginia from 1955 until he retired in 1958. Before this, he was an editor at the Library of Congress in the Air Information Division, directing and producing treatises on structural engineering as practiced by the U.S.S.R. After his retirement to his 160-acre farm overlooking the Blue Ridge Mountains, he lectured at the University of Virginia. He also published a book that all classmates will find most interesting, *Four Turbulent Decades*, Vantage Press, N.Y. 1961, with chapter after chapter covering all those critical and alarming and possibly-progressive things that have happened to us since way back in the days when we trod the sidewalks of Boylston Street. He was chairman of the Kearsage Subdivision where they lived, a member of the Westminster Presbyterian Church, belonged to the Farmington Country Club, and participated in the activities of the Albemarle Art Association, the Virginia Museum of Fine Arts at Richmond and the Charlottesville Philatelic Club. Active too in the American Association of Retired Persons, he became president of the Charlottesville-Albemarle chapter this year.

He and Mary had traveled extensively over the past few years and were

planning on their 50th wedding anniversary for this coming June. We understand Wes was Santa at the family Christmas doings. According to the local *Daily Progress*: "Survivors include his wife, Mary T. Blank; a son, W. Howard Blank, Jr. of Charlotte; a daughter, Mrs. William Turner of Cleveland, Tenn., and five grandchildren." George Maverick reports that he "went to the very impressive funeral at the Monticello Cemetery. He [Wes] was buried just at the entrance where the view is the most magnificent. Many '16ers will recall this cemetery as being on the left on the drive from Charlottesville to Monticello." Our deepest sympathies have been sent to Mary whom we got to know at the 50th reunion.

We are also very sorry to report the death of Kenneth C. Richmond, on January 20 at his home in Garden City, Long Island. Ken, an active member of the class in reunion affairs and at the monthly luncheons in New York, was executive vice president of Abraham & Straus and vice president of Federated Department Stores. As reported in the January 21 issue of the *New York Times*: "Mr. Richmond, a well-known retailing executive, was noted for his work in the field of taxes and in the pioneering of the concept of revolving credit. He was founder and past chairman of the board of the New York State Council of Retail Merchants, past president of the New York Retail Dry Goods Association and the Metropolitan Controllers' Association, Inc., and a member of the taxation committee of the National Retail Dry Goods Association. Active in civic affairs, Mr. Richmond was a trustee of the Citizens Budget Commission and a director of the Brooklyn Chamber of Commerce and the Downtown Brooklyn Association. He was a member of former Gov. W. Averell Harriman's Business Advisory Committee, the Commerce and Industry Association and the New York Chamber of Commerce. Sidney L. Solomon, chairman of A. & S., praised Mr. Richmond yesterday as a man 'who had a far-reaching influence on modern retailing. There was no one to whom a more diverse group of people came seeking advice, guidance or help,' he said. 'High government officials sought his opinion of pending legislation; young executives brought their personal as well as career problems; elderly salespeople came to discuss the details of the many employee benefit plans which Ken had been instrumental in putting into effect. In my more than 30 years at A. & S., I can think of hardly any innovations in credit, accounting, or employee relations that did not in one way or another bear the imprint of Ken Richmond's thinking.' "

Ken studied at the University of Rochester before coming to Tech, served in World War I as an ensign in the U.S. Naval Reserve, and was awarded the Navy Cross. Further from the *N.Y. Times*: "From 1920 to 1922, he was an industrial engineer with the firm of Miller, Franklin, Basset & Co. and was

controller of the Stein-Block Company of Rochester from 1923 to 1927. He joined A. & S. in 1928 as an assistant controller, became controller the next year, operating vice president in 1930, treasurer in 1943 and executive vice president in 1964. He is survived by his widow, the former Frances Comstock; a son, Dr. Kenneth C. of McMinnville, Tenn.; three daughters and 17 grandchildren." Our deepest sympathies have been sent to Mrs. Richmond.

Certainty is a mirage

You may remember our past mention of the fact that George Petit and his "trend analysis" technique have been helpful over the years in baseball management circles, especially to President Ed Short of the Chicago White Sox. Now we have asked him for a little more detail. He says his submittals (12 years) are "merely designed to indicate to management the highly probable beginnings of major (long-term) rallies and slumps during a season. The 'predictions', over a 12-year span, contain an accuracy of approximately 80 or 90 percent. 'Certainty' is a mirage!" And listen to this: "There are only about five full cycles in the games won and lost percentages from June 1st to the season's close in September. In the 1968 season four of these 'forecasts' made good with one failure for an 80 percent success. For example, when the beginning of a major slump becomes highly probable the Field Manager (now Al Lopez) may deem it advisable to alter the line-up at the weak spots and the batting order in an endeavor to thwart the expected slump. Such alterations may, of course, accelerate the slump because it is difficult to overcome natural cycles but, nevertheless, it is better to take some hopeful steps rather than none when the probability is 80 percent against maintaining the previous major uptrend. Thus a change appropriate to the situations as they appear (evidence of major trend reversals) could mean advance into the 1st division or even taking the pennant."

And finally: "Nothing can be predicted prior to June 1st because the low numbers of data involved produce tremendous variations in trends which cannot be treated for fairly reliable predictions, as you know better than I. It's as if you selected 2 or 3 samples in quality control to specify results for 100,000 items of production." Sounds so right, George, and as we have learned from Don Quixote: "The proof of the pudding is in the eating," and "Experience is the universal Mother of Sciences."

Out West

Starting out west with some of the '16 doings, we have Paul Page Austin, still active with Arthur G. McKee & Co., in San Francisco. He is currently working on an interesting project—the design of the water supply system for a copper concentrating plant in Turkey, at the eastern end of the Black Sea.

Willard Brown of Santa Barbara is another one of those who can't sit still—he attends over half of the once-a-week meetings of the City Council. And a year ago he helped to organize the new Grove Lane Improvement Association and is on its Board of Directors. Asked what he does on that, he answers: "We sort of 'ride herd', so to speak, on the City Council, to try to keep them from making all kinds of zoning exceptions and the like, many of which would go toward spoiling the truly unique character of Santa Barbara and, usually, make some entrepreneur a fast buck. There is constant pressure on the part of the few, who evidently would like to make our delightful city into a sort of small Los Angeles, with hi-rises (we have none, so far, thank goodness), a teeming commercial harbor (we have a small one but the sail and motor small boat owners can make fine use of it and do), and give up literally miles of fine beach downtown with parks running along, where our people bathe in sea and sun, picnic and barbecue, etc., just about all year round. Seems to me these various civic activities that I do spend some time on could come under the head of doing something for people. (The oil interests seem determined to grab and disfigure as much of our lovely shoreline as they can!)." Then Willard added: "Just back from the ocean front for dinner, where we had a really good California fresh lobster tail, not quite as good as Maine lobster of course, but quite acceptable. The sea food out here has many fine things, such, for example, as the abalone steaks, not to be had outside the state, I understand."

Now on to Palm Springs where *Francis and Gladys Stern* are again staying until fishing beckons and spring starts popping out in West Hartford. In his golfing early in January, Francis claims he was really hitting the ball—had a 41 in eight holes but then woe unto him—a lost ball on the 9th! Says he later found the ball in a watering hole in the middle of the fairway. He'll have his chance to demonstrate at the reunion next June at the 9-hole course at Chatham Bars Inn. Other '16ers please take notice!

Going east through Phoenix to Apache Junction, Ariz., we find (February 5) the *Harold Millses* back in the same mobile home with their Harold-made telescope, watching the stars and planets and the moon, we presume, every night. From this location in December they went west and visited their two daughters and families in California over the holiday season, then returned to their beloved desert living through February.

From Tucson, in mid-January, *John Fairfield* said he and Gladys were enjoying a month's warmth in Arizona, away from the snow and sleet they left in Troy, N.Y., using John's sister's home while she is in Chile on an astronomical errand. And: "Have phoned *Joel Connolly*, but we haven't yet gotten

together—will soon. Swim in outdoor pool twice daily, and sun bathe, and drive out for scenery (and wife's trips to tourist traps)."

Moving Eastward

Now east to St. Louis, where *Berthoud Boulton* has this to say: "For all of us life is slowing down a bit. This will be my last semester of teaching at our Community College. I find my mind keeps playing tricks on me, like a prankster, just to annoy. I am in fine shape physically and a week or so ago I had some marvelous skating on the lake on which I have a summer home. This is my eighth year as a Red Cross Volunteer making drawings, patterns and samples, mostly of toys for children in our head start program. This year reading has been a great source of pleasure as is bridge—now I have the temerity to try to learn chess."

To Lexington, Ky., to hear from *Dina Coleman* who tells us in his non-loquacious way: "I really haven't anything to report because there have been no changes up, down or sideways since I wrote you last." . . . *Vert Young* of Bogalusa, La., still finds his time preempted by the chore that he has undertaken "to try to raise \$750,000 for Gulf South Research Institute for badly needed equipment. This is a very difficult task, especially since most of our prospects are oil companies and petrochemical companies domiciled outside Louisiana and we are hoping to get substantial subscriptions from the larger ones. This involves getting the proper contact man and that alone is a big chore."

In Vero Beach, Fla., comes word from Earle and Edie Pearson that their "simple quiet life here provides little that would be of interest to the column—no travels to distant lands, no ski trips or other unusual feats for 75-year-old youngsters. No great grandchildren yet but live in hopes." . . . In Clearwater, Fla., *Howard Hands* says he hasn't had as much to brag about in 1968 as in the preceding year—only one operation, gall stones again. Then: "*Ralph Fletcher* and I are contemplating a new business venture—I'm to provide the gall stones and he will promote their sale as a specialty with his granite. Details not yet available." If we apply *George Petit's* trend analysis principles to the data that Howard has been giving us, then 1969 looks like a much better year for our good old E.E. lab partner!

John and Gretchen Gore of Canajoharie, N.Y., continue to be part of the great outdoors, with extended summer-time canoeing at their lakeside cottage in the foothills of the Adirondacks, watching their grandchildren win Comet and Sunfish sailing prizes, and staying through quiet September with a little chopping and splitting of fireplace wood. Then they had a week in Rockport, Mass., enjoying the "stern and rockbound coast," and comparing notes on bird-watching with

John Kieran. Our John strongly recommends to '16ers two books by John Kieran, *Footnotes on Nature*, and the autobiography, *Not Under Oath*.

And who was Aesculapius?

Paul Duff, probably still the only doctor in Peabody who will go out on sick call, sends in a little fun on a prescription slip that reads like this: "We sons of Aesculapius must never stop studying. My secretary has just told me how to know how to make the diagnosis (elusive as it is) of Hong Kong flu. You look carefully at the eyes of the patient. If they slant a little and they are turning yellow—that's the Hong Kong flu!"

Now that big word he used stopped us, really stopped us. We wrote back, asked him what it was, and this is how he replied: "Aesculapius was the demi-god of healing. It is this caduceus" (another big word—you look it up; you secs.) "with single snake which is often used as the emblem of doctors. The double snake (with wings) caduceus is the staff of Mercury" (go see statue of Mercury of Bologna in Paul's office) "who is the patron god of doctors and thieves!" Thus it is that your secretaries are always learning something!

Duncan Oowler of Fall River, whom we now hope to see at the reunion in June, says that writing a letter seems more of an effort than playing 18 holes of golf or shoveling off the sidewalk. Says he has little news to send in, his health is good, and he occasionally meets two '17ers at directors meetings in Boston (Duncan used to be president and general manager of the Fall River Electric Light Co.) which gives them "a chance to talk about the old days at M.I.T. or Boston Tech as we used to call it." . . . *Theron Curtis* in Barrington, R.I., claims he has no news, is "just sitting around the warm house and hoping the oil supply holds out." Then: "After the busy holidays we need a rest. Had the whole family together for the first time in 27 years. Wow!"

From *Rudi Gruber* in New York, we have: "You ask for 'safari news.' I was in Europe twice in 1968, in May/June and again in October/November. Both were 'family' occasions. In June the Gruber-family-reunion was held at Lindau, Lake Constance (Bodensee); with attendance of 69, ranging from two years to 81 (yours truly a 77'er). The second visit included the golden wedding of my younger sister, in Hamburg. Both return flights, Lufthansa from Hamburg, were marked by landing-delays at Kennedy—four and a half and three and a half hours, respectively. I frequently get to Cambridge, to discharge my duties as member of the Corporation Development Committee, a very rewarding engagement!" (In the 1968-1969 Directory of Alumni Officers, Rudi appears as Alumni Representative of the M.I.T. Corporation Visiting Committee, Modern Languages).

The next 1916-1917 class monthly luncheon at the Chemists' Club, 52 East 41 St., New York City, will be held at noon, Thursday May 8. If you are coming to New York, plan to come then. Those present at the February 6 luncheon were *Joe Barker, Rudi Gruber, Mac McCarthy, Peb Stone and Harold Dodge* and for 1917; *Ed Aldrin, Enos Curtin, Bill Hunter, Dick Loengard and Dix Proctor.*

Again, many thanks for responding so well to our little urgings for bits of news and philosophy. We have letters from *Joel Connolly, Dan Comiskey, Frank Darlington, Ned Hewins, Harry Lavine and Merrick Monroe* to be covered in the next issue. As the summer approaches, keep well, drive carefully, come to the reunion at Chatham Bars Inn June 13 to 15, and keep writing just a little but often to any of your officers.—*Harold F. Dodge*, Secretary, 96 Briarcliff Road, Mountain Lakes, N.J. 07046; *Leonard Stone*, Assistant Secretary, 34-16 85th Street, Jackson Heights, N.Y. 11372

17

Editing these notes on February 11 is a pleasure while looking out over the North Jersey landscape blanketed by 12 to 15 inches of snow.

Son may be 1st man on the moon

Since the last notes an item of great interest to the Class is the announcement that *Buzz Aldrin*, our honorary member, has been selected for the coming landing on the Moon. *Ed Aldrin, Sr.*, referred to a January 1968 *Review* note, "In reporting the Manned Space Craft Center's choice, United Press pointed out that the first test crews from previous N.A.S.A. series have later been chosen for the first full mission in the series." Thus it seems to have come to pass in the selection of Buzz for the mission now set for this coming July. Press notice from Washington, Jan. 10—"NASA names Crew to Land on Moon—A civilian and two Air Force colonels who have walked in space will fly the Apollo mission, the first scheduled attempt by the U.S. to land men on the moon. The civilian astronaut, Neil A. Armstrong, will command the space craft, tentatively set for launching in July, the National Aeronautics and Space Administration said in announcing the selection of the crew. Armstrong and Col. Edwin E. Aldrin, Jr. are to descend to the moon in a lunar module from the main space craft. The main space craft will remain in lunar orbit, piloted by Lt. Col. Michael Collins." Buzz is hard at it preparing and Ed says he is best equipped for the undertaking. Besides the 86 different routine items on flight control, there are still many minor details to be worked out. May Buzz put his best foot forward on the Moon and all of us Seventeeners will be wishing him the best of luck.

'17 represented

At the Alumni Advisory Council held at the Faculty Club January 27, '17 was well

represented in the 200 present. *Al Lunn* sat at the head table and the two secretaries plus *Don Severance*, H.M., were seated among the tables, and during the very excellent dinner served by the Faculty Club, President *Howard Johnson*, H.M., circulated amongst the tables. It was a very interesting discussion and shows that there is a management problem in this changing world, as applies to schools and universities.

Classmates deceased

Our Class had another record, although of a sad nature. In the New York Times of January 22nd there appeared side by side the obituary notices of two of our very illustrious classmates. *Robert S. Moulton*, 244 Glen Road, Weston, Mass., and *Kenneth C. Richmond*, 97 10th Street, Garden City, N.Y. "*Robert S. Moulton*, an authority on fire protection, died Sunday at Waltham Hospital. He was 74 years old. Mr. Moulton directed the technical and standards activities of the National Fire Protection Association in Boston for more than 30 years. He had been with the association 41 years and resigned in 1961, but he continued to act as an advisor. He received science and engineering degrees from Amherst College, Harvard and Mass. Institute of Technology. During World War II, Mr. Moulton served as fire protection consultant to the War Department, the War Production Board, and the Office of Scientific Research & Development. He was editor of the Handbook of Fire Protection and of the Quarterly of the National Fire Protection Association. Surviving are his widow Florence, a daughter and three sons." The notice advises in lieu of flowers, donations may be made to Weston Forest and Trail Association, Inc., 263 South Ave., Weston, Mass. 02193. Bob passed away on the 19th of January.

On *Kenneth C. Richmond* who died on January 21, "Executive Vice President of Abraham and Straus and Vice President of Federated Department Stores, Inc., he was 74 years old. Mr. Richmond, a well known retailing executive was noted for his work in the field of taxes and in the pioneering of the concept of revolving credit. He was a founder and past chairman of the board of the New York State Council of Retail Merchants, past president of the New York Retail Drygoods Association, and the Metropolitan Controllers Ass., Inc., and a member of the taxation committee of the National Retail Drygoods Ass. Active in civil affairs, Mr. Richmond was a trustee of the Citizens Budget Commission and a director of the Brooklyn Chamber of Commerce, and the Downtown Brooklyn Ass. He was a member of former Gov. Averell Harriman's Business Advisory Committee, the Commerce & Industry Ass. and the New York Chamber of Commerce. The chairman of Abraham and Straus praised Mr. Richmond yesterday as a man who had a more far reaching influence on modern retailing. 'There was no one to whom a more diverse group of people came seeking advice, guidance or help. High government officials sought his opinion of pending legislation; young

executives brought their personal as well as career problems; elderly sales people came to discuss the details of the many employee benefit plans which Ken had been instrumental in putting into effect. In my more than 30 years at A. & S., I can think of hardly any innovations in credit, accounting, or employee relations that did not in one way or another bear the imprint of Ken Richmond's thinking.'

Mr. Richmond studied at the University of Rochester, and received a Bachelor of Science degree in 1917 from the Mass. Institute of Technology. During World War I he served as an ensign in the U.S. Naval Reserve and was awarded the Navy Cross. From 1920-22 he was an industrial engineer with the firm of, Miller, Franklin, Basset & Co., and was controller of the Stein-Bloch Company of Rochester from 1923-27. He joined A & S in 1928 as an assistant controller, becoming controller the next year, operating Vice President in 1930, treasurer in 1943 and executive vice president in 1964. He is survived by his widow, the former Frances Comstock, a son Dr. Kenneth C. of Mc Minnville, Tenn.; three daughters, Mrs. Patricia Ann Gorman of Menands, N.Y., Mrs. Nancy Hanks Mueller, Jr., of Madison, Wis., and Mrs. Gail B. Matthews; a sister Mrs. Geraldine Potts of Rochester and 17 grandchildren."

George W. Donovan passed away November 17, 1968. His address at that time was the Village Villa, Apartment 215, 7330 SW 82nd St., South Miami, Fla. Quoting from the 30th anniversary report, "Enlisted in Army, but refused on physical reasons; same in Navy. Spent War years with Boston firm on Army Base job. Couple of years in Virginia with Boston engineering firm, went with Merrimac Chemical Company in 1922 as superintendent of construction. When Monsanto took them over moved to St. Louis as plant engineer. Always have kept in touch with progress of the Institute and am proud to be a graduate of a school which has made such a name for itself throughout the world. Play at golf and do a bit of fishing which has included canoe trips into Canada. Have seen a lot of the U.S., but nothing foreign."

Helen (Isham) Hill, wife of our past treasurer of long standing, died January 25 after a brief illness. Besides Lucius she leaves a daughter, Mrs. John K. Stanton, of Marion, Mass., a son, Dr. Lucius T. Hill, Jr., of Exeter, N.H. and 7 grandchildren. In lieu of flowers contributions were to be sent to the Peter Bent Brigham Hospital Intensive Care Fund.

'While at the Alumni Advisory Council meeting on January 27, word was received from Conchita Lobdell Pearson that her husband, Harold C., '23, died suddenly on the 24th of January in Mexico City. This was indeed a shock and especially to Ed Aldrin, Sr., who said he visited with the Pearsons while in Mexico City January 6th.

A letter dated January 25 from C. C. Coakley of Richmond, Va., "I just ran

across a very old letter from Harold A. Schlaffhorst, Course X. I thought he might be interested in it if he were alive. I have looked in the 1967 Alumni register and I cannot find him either among the living or dead." The fact is he changed his name to Haven in 1926. Mail returned from New York City in 1967 was marked "deceased" so our 50th booklet records him as "assumed deceased."

For the record quoting from a letter of January 9 by Panos D. Spiliakos, Assistant Secretary of the Alumni Association, "Don Severance and Fred Lehmann check every notice of alumni who have passed away and Fred sends a brief note of condolence to every family. While this was begun with some uncertainty, we find that it has been greatly appreciated and we shall therefore be continuing the practice."

Allison R. Williams widow, Henrietta writes from Vicksburg, Miss., "I did not receive the notice from *Dud Bell*, however I could not have attended the 51st Reunion. Allison's old Buick is still up in Mass. in some friend's backyard and when you mentioned the date of the 51st to be held at Sturbridge I had a glimpse of a slight possibility of being in that locality. I do not know what the problem is or the solution but, it is as though Allison had never been a part of M.I.T. with the exception of one request for the widow's contribution sent to an erroneous address and weeks before it reached me, nothing else has been sent this way, not even the usual announcement of graduation day, etc. The last *Technology Review* I received was of July 1967 thus missing the report on the 50th Reunion." As of January 28 she advises, "*Technology Review* just received—I love it; thumbing through reveals many interesting subjects and the paper and print is so nice, it is all I can do to put it down."

Didn't attend

Comments made by those not attending our 51st Reunion at Sturbridge, Mass.: *Walter F. Pond*, "Back home in Wyoming for the summer—too far to Sturbridge, regrets." *Barney Dodge*, "We will be in Yugoslavia at the time, we sail on the Queen Elizabeth spending a month at invitation of the Academy of Sciences. Last November Mrs. Dodge and I returned from around the world, spent three months in Australia teaching at the University of New South Wales. We visited 11 countries in all. Can supply more details if desired." *James P. Ferrell*, "Sorry we can't make this one, going to Westminster, Md., to wedding of a grand-nephew and thence motoring to the Carolinas and Florida." *Phil Maher*, who attended, "Health good, still in active practice as a public accountant—no paid holidays, bonuses, or fringe benefits. Recreation, golf when possible and two martinis before dinner, strictly for medicinal purposes." *William H. McAdams*, "My wife and I have been going to the Sea Breeze Holiday in Palm Beach, Florida for past three years. We stay from the middle of November until Decoration Day." *Erling B. Stockmann*, "During the

week of October 6 to 13 we shall be in northern Maine on the prowl for partridges." *Al Ferretti*, who attended, "Laura and I had hoped to take another cruise to the Caribbean but had to change plans. Drove to Florida as far as Key West and enjoyed most of the state this past spring."

As of January 13, *Al Lunn* advised that our 55th Reunion will be at Chatham Bars where we had our illustrious 50th; on Cape Cod, with *Tubby Strout* in charge again. Also *Stan Lane*, our treasurer reports treasury solvent thanks to many contributions. Lastly, that 41 widows were donors to the Class Memorial. Everyone should be sure to see the February issue of *Technology Review*, pages 77 and 84, 85 showing the reproduction of our Nelson Chase's painting now hanging in the entrance of President Johnson's office.

The February luncheon of the '16-'17 New York group at the Chemists' Club was attended by 10 equally divided between '16 and '17. It was good to see Joe Barker looking his normal self after spending last December in the hospital. He says, "The cheery notes from so many wonderful friends acted like booster shots to the anti-biotics, which licked the pneumonia. As long as I had to be in the hospital we took the opportunity to inspect all the plumbing and mechanical gear and I have an A-1 rating now." Also good to see our *Ed Aldrin* looking so hale and hearty. *Ray Brooks*, who also had a siege of hospitalization in December, had planned to be with us, but the bus service was on strike.—*C. Dix Proctor*, Secretary, P.O. Box 336, Lincoln Park, N.J. 07035; *Stanley C. Dunning*, Assistant Secretary.

18

As I start these notes, we are experiencing a mid-winter Northeaster in Boston, winds at gale force, twenty inches of new wet snow, and in general, nature is on a wild rampage. And the thought now going through my mind is this—can we do anything about it? Is the basic knowledge we received at M.I.T. (plus what has been discovered since then) and the new truths to be revealed to us in the technological decades immediately ahead of us to lead to a control of the weather so that the wind will be gentle and not howl and the snow will be permitted to fall to a two-inch depth—just enough to beautify nature? It sounds crazy but is it any more so than the concept of nuclear energy was in our undergraduate days?

I am intrigued with what so many of you do (examples to be found in this month's notes). Since the reunion, two of our classmates have travelled far and wide—but they have been keen observers of what they have seen, and have written most interesting descriptions of the highlights of their trips. Because of the length of their reports, I am going to give them to you in serial form over the next few issues.

Land of the Midnight Sun

The first report, titled "Land of the Midnight Sun," is from *Tom Brosnahan* who is, perhaps, our most assiduous globe trotter.

"After six hours and thirty-five minutes of flying time from Kennedy, we arrive at our destination in Bergen, Norway. We recognize parts of Bergen from a previous visit, but we do not have much time for sight-seeing as our boat the *Polarlys* a medium-size vessel designed to carry both passengers and freight, embarks for the far North this evening. . . . The following day we make brief stops at Maloy, Alesund, Molde and Kristiansund. Mole is noted for its flower gardens and is sometimes called the Town of Roses. It lies at the foot of several hills, providing a fantastic panorama of eighty-seven snow-capped peaks.

"Early the next morning, we arrive at Trondheim, which was founded in 977 AD by the Viking King Olav. An excursion has been arranged for us to Ringve Manor House, which is now a museum for musical instruments. It was originally the home of a wealthy Russian widow who was very fond of music. She collected instruments of various types from all over the world and maintained that they should be played frequently so that they would retain their tones and people could enjoy them. Contrary to custom at museums therefore, visitors are encouraged to try their skill on the instruments, provided, of course, that they know how to play! Sailing out of the harbor at Trondheim, we observe the island of Munkholmen where, in the 11th Century, the Great King Canute was so idolized by his subjects that they attributed supernatural power to him. One day he sat at the water line on the beach, and commanded the tide to rise no further. His feet soon became wet, thus convincing his subjects that he was only human just as they were.

"We cross the Arctic Circle, which is evident only on our map. On the port side of the ship is the lion-shaped mountain of Rodoylova. On the starboard side, we see the Svartisen Glacier which rises 5,300 feet above sea level and covers an area of 200 square miles. In Bodo, famous for a beautiful cathedral consecrated in 1956, we have time for shopping before crossing the Vestfjord, a large stretch of open sea. As we sight land, we note the Lofoten Wall, an enormous breakwater extending in jagged peaks for nearly 60 miles. . . . Harstad is an important trading center situated on Hinnoy, which is Norway's largest island. We continue through narrow channels between islands and the mainland to Tromso, the capital of North Norway, famous for fishing, whaling and seal hunting. Many Polar expeditions have started from Tromso. In the harbor there is a statue of the Arctic explorer Roald Amundsen.

"The island of Hjelmsøystauren is one of the largest bird sanctuaries in the world. As many as 200,000 sea birds breed here in May and June. They are mainly kitti-

wakes which are about the size of pigeons. Apparently they enjoy the climate on the seemingly barren rocks and manage to obtain enough food for survival. Our ship drops anchor in the bay of Skarsvag at the North Cape. We reach the shore in a small boat and a bus takes us to the summit at an elevation of 1,000 feet. We are approximately 1,200 miles from the North Pole. The temperature is about 50° and it is so windy that we need both a sweater and a topcoat. In the far North, the temperature occasionally reaches 75° to 80° in the summer. The average is in the fifties. In the winter it drops as low as 40° below zero. There are vast areas of barren land with no trees as frost remains in the ground permanently, except for a few inches at the surface in the summer. Vegetation grows to a height of four or five inches providing food for reindeer. Kirkenes on the border of Russia is the turning point of our voyage. It is well known for its extensive deposits of iron ore. A local mill provides most of the steel used in Norway." We will continue Tom Brosnahan's travel in the next issue of the *Review*.

Around the World in 59 Days

And now on to our second interesting travelogue, also in serial form, by Jack Poteat—"Around the World in 59 Days." "Columbus Day on Maui; Election Day in flight between Tokyo and Taiwan; Armistice Day at Angkor Thom in Cambodia; and Thanksgiving Day, with all the traditional fixin's, at the Hilton in Tehran. Such were the locales of our celebration of the fall holidays. And these places were part of the Mother Lode we mined for the opening of our eyes so that this journal might be written. This also explains why an account of our trip, which several have asked for, belatedly takes the place of our usual Christmas greeting.

"About 30 adventurers under the sponsorship of the Brooklyn Museum, boarded a plane in New York October 11, for an Art Study Tour of the Orient. After a refueling stop in San Francisco, we winged our way to Maui for rest and briefing. A very knowledgeable former curator of the museum was our lecturer for the entire Art Study Tour.

"Some general comments before any recounting of specifics. Our wandering

took us to places of primitive living as in Nepal, as well as sophisticated Hong Kong; from a large city such as Tokyo to small backward Siem Reap, the stop off for Angkor Wat; from modern high rise buildings to mud walled native dwellings; from traffic jams to traffic free rural highways; from lush rice country to unending barrenness as in Iran; from the beauty and freedom of our own country to the strain and restrictions of Cambodia. The aggressive industry of the Japanese contrasts to the humility of the Indians and the confident air of the Iranians with the resignation of the Nepalese. Tokyo is one massive traffic jam but it has the finest hotel we've ever occupied. Taiwan is stiff-upper-lipping its way into an uncertain future. Hong Kong lives up to its reputation and a cocktail party aboard a motorized Chinese junk, cruising the harbor, was a fabulous extravaganza! Floodlighting of the Temple at Angkor Wat, as we sat at dinner our first night there, was almost unreal. Bangkok with its Disneyland of Temples and the waterfront traffic and markets, could have been enjoyed more had the weather not been so hot.

"But what of this Art Study Tour? The most exciting museum was the National Palace Museum in Taipei where 270,000 treasured items from old China, salvaged by the Nationalists when they evacuated the mainland, are stored. They were spirited across China for decades, buried in caves, carried on sampans, hidden from the Japanese and then the Communists and finally reached Taiwan. They stand for 4,000 years of China's evolution. The museum is built on the side of a hill and a tunnel into the hill behind the museum holds these treasures in scores of crates. Amazing objects of jade, bronze, ceramics etc., demonstrate the consummate art and dexterity of the Chinese craftsmen of olden times.

"But let's get back to Japan where we spent three weeks. The Shinto Shrines at Nikko are very elaborately decorated and the 3 famous monkeys are carved on the front of the stable. Monkeys are supposed to be the protectors of horses but their 'See no evil, hear no evil and speak no evil' might well be adopted by the human animal in many situations. These shrines are in sharp contrast to the Zen

Buddhist temples at Kamakura, which are almost entirely devoid of decoration, but quite befitting the meditative Zen sect in their stark simplicity. And they stand in a magnificent grove of cryptomeria trees. A Zen monk guided us, took us into a hall to see a 13th century carved Buddha, demonstrated for us the meditation pose, sounded the huge gong and clapped two wooden plats together to alert the spirits. At almost every temple or shrine, hordes of school children were being herded through. Dressed in uniforms and with colorful hats, they were well behaved but always in the way. After all, it's one way to occupy them, since there aren't enough school rooms to accommodate all the children at the same time. Our lecturer called them 'Mindless darlings.'

"Peace, repose, restraint, simplicity, withdrawal, these are qualities one enjoys in an Oriental garden. The Japanese garden is not a thing apart from the Japanese home. The house is simply the roofed-over section of the garden. Family selection of a daughter's husband; the position of the wife in the home; the numbering of houses, not by position on the street but by the sequence in which they were built, seem strange to us, but explanation of the importance of gardens with the house in a secondary role, is revealing. In ancient times Zen Buddhist monks were masters of art, painting and literature. Later in the 1500's they translated the Chinese black and white landscape paintings into 3 dimensional form and thus created gardens for their seclusion and meditation. There are few flowers in Japanese gardens. They are made of stone, pools, waterfalls, bridges, shrubbery, evergreens and swirling sand beds. Azaleas grow in gardens where flowers are desired. The very small gardens were the inspiration for the development of Banzai shrubs to maintain proper proportions.

Two sailings on the beautiful Inland Sea at sunset; rides on the fabulous high speed trains; 8 separate views of Mt. Fuji—we saw it from every place where we might be expected to see it. We even saw it from Tokyo where it is seen barely 30 times a year. It was rice harvesting time in the orderly rice paddies; the pearl farms; the persimmon orchards; lunch in

a Buddhist monastery; tea ceremony in a private home; dinner in a Geisha restaurant; the Kabuki theater and back stage visit with the star; the Nho play; the Gagaku dances in the Imperial Palace grounds—these are but a few of the interesting experiences we enjoyed in Japan.

Post reunion travel

At this late date, I include another excerpt on the travels of *Ned Longley* after our 50th reunion as follows: "As planned, we took off immediately after the reunion for Hawaii with a stop at Salem, Ohio, to pick up our daughter Dorothy and her fine husband Henry Zimmerman, and a stop at Los Angeles where Rob's widow, Esther, joined us. A fine weather voyage on the S.S. *Lurline* landed us in the beautiful islands. Don't let anyone tell you (as the old timers would have you think) that the islands have been 'spoiled.' It is perfectly true as you, of course, know, that Honolulu has grown tremendously since Hawaii became a state and that it and the popular and famous resort places have been loaded with high rise apartments and large luxury hotels which do mar the landscape in those spots, but the islands are still wonderfully beautiful and interesting with their beaches and surf, mountains and ever green lush valleys, sugar cane and pineapple fields, volcanoes, active and inactive, and a most interesting friendly and truly integrated cosmopolitan population. We roamed all the islands where all the itchy-foot tourists are welcomed and had a good and interesting time."

50th wedding anniversary

We are indebted to Al Lunn, '17, for the following news item about Herb Polleys as follows. "On Sunday, January 26, Peg and *Herb Polleys* of New Haven, Connecticut celebrated their 50th wedding anniversary. Hosts for the delightful occasion were son and daughter-in-law, Mr. and Mrs. Rhodes Polleys of Concord, Mass. Guests included Sue and Al Lunn of Cambridge. Herb has retired, but continues to do consulting work which brings him to Boston frequently. Rhodes, a graduate of Yale in Chemical Engineering is taking a year of graduate study at the M.I.T. Sloan School sponsored by his company, I.B.M." Congratulations from all

of us to the Polleys—and thank you, Al, for forwarding the information. . . . We are happy to report that *Al Grossman* is back on the job as President of Stedfast Rubber Company after a short and not serious visit to the hospital. He tells us that *Harry Le Vine* is recovering nicely under the watchful eye of his Eva following surgery. . . . *Pete Harrall* has a new job, he is administrator of the Church of the Redeemer in Baltimore. In addition, he has bought another small farm and is building a new home. What next, Pete?

Peace and charm

Before including a most interesting autobiography of *Ed Rossman*, I add these personal observations. Upon his retirement from General Motors, Dorothy and Ed made a thorough research of where to live. They selected Paris Hill, Maine, because so many semi-precious metals can be found in this area. Their home, over 100 years old, was restored by them with great care, and has been furnished with unusual period antiques. Most of these pieces, in poor condition, had been discovered and purchased by them in rural Maine and refinished with their own hands. Selma and I have enjoyed their hospitality in this charming home; from it you can look across the valley at the White Mountains 50 miles away. It is a place of peace and charm with hosts to match. Now for his autobiography.

"I was born in Hudson, N.Y., August 5, 1893 and lived there until 1898 when my family moved to La Harpe, Kansas, where my father had accepted a position as accountant for the Lanyan Zinc Co. As more smelters were built we moved to Iola, then to Caney (which was a half mile from Indian territory), and later to Oklahoma. This was a part of the Wild West in those days. On one occasion the town marshal was shot and frequently some of the notorious outlaws would create excitement in the town. Of course, there were no paved streets and that Kansas dust was the despair of my mother. The family horse, 'Nimrod' provided our only transportation. You would have to beat him to make him leave the barn but when he was headed home he could outrun any racehorse.

"My early schooling (readin', writin' and 'rithmetic) was acquired in the one room

schoolhouse and the schoolmaster didn't believe in sparing the rod to spoil the child. When the Lanyan Co. was sold to the American Zinc Smelting Co., my father became General Manager for the district and we moved to St. Louis, Mo. There I completed my secondary education at Soldan High School, a far cry from the small town schoolhouse. In 1913, I entered Case School of Applied Science in Cleveland, as a student in mechanical engineering. When I transferred to M.I.T. in 1915 I was given credit for all courses completed at Case but did not have enough credits to finish Mechanical Engineering in two years. I decided to combine the M.E. course with the regular Electrical Engineering (E.E.) which could be completed in three years, with other courses which could be selected later.

"Nineteen-seventeen—time out for War! In June of that year I returned home to enlist in the Missouri National Guard Supply Train. This became a part of the 35th Division which was being assembled at Camp Doniphan, Fort Sill, Okla. After approximately ten months training the 35th Division was shipped to France. The 35th Division was returned to the U.S.A. in April, 1919. After my discharge in May, 1919, I returned to M.I.T. for refresher courses that summer and to select the subjects required for my graduation in June 1920. Actually, only a thesis acceptable to M.I.T. was required. However, I decided to take other courses as well—business management, business law, accounting, humanities, heat treatment of steel, automatic machine design, etc.

My thesis was suggested by the Dennison Mfg. Co., 'The design of an automatic machine for making and assembling jewelry marking tags.' The thesis was completed in June, 1920, and accepted by M.I.T. I received an offer from Dennison and also from the Easton Paper Company, Brewer, Maine, which I accepted. Six months later Mr. Frank Scully, M.I.T., '15, who had acquired the sales rights for the Houdaille shock absorbers, offered me a position as installation engineer and I accepted it.

"During the next four years Mr. Scully and I contacted most of the automobile companies in the States and had Houdaille shock absorbers on test. I attended



Peter Strang, '18—worst athlete but most useful

all the yearly automobile shows in New York and Chicago, obtained engineering information on the new models, prepared installation instruction sheets for the Houdaille dealers and the car companies. The Houde Engineering Co., Buffalo, N.Y., had acquired the manufacturing rights, prior to 1920, and had made all the shock absorbers distributed by the Houdaille Co. In 1925 they purchased the sales rights from Mr. Scully. Throughout the last four years I had become acquainted with our competition in the hydraulic shock absorber field, particularly the Lovejoy Mfg. Co., of Boston. In 1925 I joined that company. Two years later, in June 1927, General Motors acquired the Lovejoy Co., and I went along with the sale. The Delco Products Division of General Motors, Dayton, Ohio, had been developing shock absorbers for use on the G.M. cars and I just fitted into their program.

"Late in 1933 the company sent me to Italy to work with the Fiat Company in Turin. That was during the height of the Mussolini regime and the forbidding repression by the Fascisti. In spite of that fact, I occasionally had enjoyable holidays sightseeing in both Italy and France. This was my first trip to Europe since my war years and, indeed, there was a sharp

contrast—this time, luxurious hotels, comfortable beds, excellent food, and I wasn't driving a five ton truck to and from the Front! . . . When I returned to the States early in the spring of 1934 my work was resumed at Delco Products and in a few short years, as we all know, the war clouds were gathering once again. During World War II, I was Chief Engineer and later became Engineer in charge of new developments. I had enjoyed my work and in my thirty year association with Delco Products I had taken out sixty three patents, assigned to General Motors Corporation.

"So much for my business career—but, there's another part of my life which I still am enjoying. Shortly after my return from Italy, Miss Dorothy Gandall and I were married in Dayton, September, 1934. We have two sons, Ed born in 1936 and Dick in 1938. We experienced all the normal problems and joys of rearing a family. Ed graduated from Case Institute of Technology, 1958, Mechanical Engineering. He is married, lives in California and has two little boys. Dick graduated from M.I.T., 1961, Chemical Engineering. He is married, lives in Milton, Mass., and has a little boy and a little girl. Naturally, our four grandchildren, all of them toddlers, are the smartest anyone could have.

"At the end of World War II, and thinking ahead to retirement years, I felt the need for taking up a hobby. Golf wasn't quite the answer and since I had always been interested in rocks I decided to become a rockhound and lapidist, in my spare time. That was a happy choice—the whole family enthusiastically joined in, the boys took to it like ducks to water. Our summer vacations were planned to include the most exciting locations for agate, jade, tourmaline, rose quartz, copper minerals, etc. What a thrill when one of us unearthed an unusually good specimen. In all fairness, I must say our best cutting material was picked up at rock shops along the way. Over the years we've covered every state in continental U.S.A. in search of rocks and in the process we discovered the magnificence of this great country. With all the rocks I was accumulating it was inevitable that I would take up cutting, polishing, carving and later, jewelry making. In the beginning I made all my equipment but as the hobby expanded I invested in commercial equipment. My specialties are strands of beads, rings, bracelets, pins, earrings, and some animal carvings. I have just one enthusiastic, non-paying 'customer'—my wife—and she absorbs my entire production.

"When Dorothy and I retired to Maine in 1958 we bought an old house (1803), which we have been restoring ever since. Guess you would call it a second hobby and there's never a dull moment. Now that our family truly is scattered from Maine to California we look forward to an annual trip West, gathering rocks along the way. Of course, we drive—after all, I was associated with General Motors for thirty years."

Worst athlete but most useful

Sometime ago, I promised you an autobiography of *Peter Strang*. Not included by him are these two quotes from the 1918 *Technique* under statistics: "Who is the Worst Athlete? Pete Strang wins. Pete has to brace himself to remove a thumb tack, while George Halfacre, in spite of his real ability as a runner, ruins it all with his line of talk." "Who is the Most Useful? Pete Strang wins; he always has his problems done in the a.m." Pete is continuing to live up to these keen and incisive observations. He has made a thorough study of various immigrations and movements of peoples in the U.S. From this research you can see the causes of poverty and racial difficulties and, perhaps, do something constructive about a solution. I was a participant in an "ecumenical" luncheon at his home. Other participants included Father Linehan of the Weston observatory and Dr. Smith who is pastor of his church. Here is Pete's story.

"Being physically disqualified for military service during World War I, Professor E. H. Schell situated me at the Hog Island Shipyard to help install a Material Control System. This system, sponsored by Professor Schell, was one of the early attempts to automate office routine by means of machines and punched cards now commonly used in modern computers. After the war I worked for a local capitalist in South Carolina. The duties were rather diversified. I was assistant manager of a textile loom supply company, assistant manager of a small ball bearing company, manager of a 1,200 acre cotton farm, and treasurer of a small construction company. It was here that the looming problems of growers and manufacturers of cotton began to interest me greatly.

"During the Coolidge and Hoover Administrations, I became Senior Cotton Technologist in the Bureau of Agricultural Economics of the Department of Agriculture and made surveys of the qualities and quantities, by grade and staple length, of the cotton consumed by this nation's mills. The objective of the surveys was to show the growers the kinds and amounts of cotton used by their foremost customers. After Roosevelt was elected the slogan in the Department became, 'To the Victor Belong the Spoils!' Consequently the appropriation for a project led by a Republican, friendly with the manufacturers, was promptly cut off. At that time agriculturalists looked upon the manufacturers as heartless business men who constantly took advantage of the cotton producers.

"In the early 1930's A. C. Walker, '18, Course X, made extensive tests for the Bell Telephone Laboratories which showed there were wide variations in the physical, chemical, and electrical properties of cotton. These findings prompted me to organize a project under the Division of Industrial Cooperation at M.I.T. where I spent two years during which methods and apparatus were developed

to measure electrical properties of specimens from bale samples under controlled conditions of temperature and humidity in order to aid mills to determine the spinnability of their purchases. (Commercially, cotton is evaluated by men who, through long practice, have acquired an art which involves the senses of sight, touch, hearing, and smell. In 1967 Dr. Edward F. Rabe, Professor of Pediatric Neurology at Tufts University School of Medicine, after observing a cotton classer at work told me that as the classer performs, five sections of his brain collect data as independent computers and final judgement is made by integrating the data from the mental computers. For several years the electrical readings correlated closely with results obtained from 12 bale spinning tests in a mill where I had installed a technical group to pass upon the merits of new machinery. Unexpectedly in the late 1930's there appeared to be no correlation. Later I found that the peak of an 11 year sunspot cycle had occurred at that time. However in the meantime I had made an intensive study at the Lowell Textile Institute of the limiting factors which existed in the current textile processing machines. Sunspot activity, high earth resistivity, and magnetic latitude were found to have caused unusual difficulties for the telephone and power transmission industries and the region in which the difficulties were most severe included the place where the spinning tests had been conducted. Solar radiation had increased the air's ionization which in turn had affected cotton spinning. Some 20 years later through the cooperation of Father Daniel Linehan, S.J., of the Weston Seismographic Observatory, we were able to show that disruptions took place in New England cotton mills shortly after a solar disturbance had caused a magnetic storm on the earth.

"With World War II in the offing I became an officer in the Naval Reserve. The Norden Bombsight, which had been developed under the auspices of the Navy, was then a closely guarded secret weapon. The first sights were equipped with ball bearings produced by the American subsidiary of a foreign company which also had subsidiaries in Germany. Because some bearings in this delicate mechanism were of intricate design, the Navy was disturbed to find that drawings and specifications of all special bearings made by a subsidiary had to be filed with the parent company, where they were accessible to all subsidiaries. Consequently the Navy established its own facility under a high priority rating to ensure a constant supply of bearings for the sight and reduce the chances of espionage. Danbury, Conn., a depressed industrial area, was selected by the War Production Board as the site for a precision ball bearing company, the Barden Co. I was appointed Resident Naval Inspector of Ordnance there. Since new manufacturing plants were under the jurisdiction of the War Production Board, I also became the Navy Working Member of the WPB Army-Navy Bombsight Ball

Bearing Committee. A hat-band factory was remodeled, precision machinery collected and installed, and unskilled workers were trained at government expense to staff the company. Within a year the new plant was producing the major part of the specialty bearings for the bombsight.

"At the end of the war I became a Research Associate at the Institute of Textile Technology for several years and then a Research Consultant with the Whitin Machine Works, a company which had been making textile machinery in Massachusetts for over a century. By happenstance at Whitinsville I met Lawrence Keeler who also had the textile industry in his blood as he was a direct descendant of the company's founder. Independently, Keeler had the idea of transporting fibers in a stream of water through a tube in order to make them parallel. I had the idea of spinning fibers into yarn while in a stream of water. By combining the two ideas we made yarn by an entirely new process which we called 'Fluid Spinning.' During this development we had Professor Rightmire of the Mechanical Engineering Department and Professor Vivian of the Chemical Engineering Department as consultants (at first) but they became so interested in the scientific aspects of the process that we made them members of the controlling group. We have been granted eight American and several foreign patents but to date we have been unable to find financial backers for a development which will ultimately make existing spinning and its preparatory processing equipment obsolete. However, qualified textile research men have informed me that principles gleaned from our process have caused the machinery makers to try to modify their present equipment. One such attempt which is attracting much attention, is termed 'Free End Spinning.'

"In general the cotton textile industry and its machinery producers have not considered basic scientific research worthwhile for equipment which has proved satisfactory for more than a century and they have been satisfied to look for gadgets to modify old machines or ways to cheapen the costs of new machines. At the other extreme many scientists have tended to denigrate and antagonize the industry by assuming, without either a study of the prior art or a thorough knowledge of existing practices, that the application of their science to the industry would produce miracles.

"Over the years I have been able to call to the industry's attention instances where an early inventor had empirically stumbled upon and adopted a principle of a science of which he was entirely ignorant. The principles of aerodynamics were shown to govern the textile carding process whose machines for 150 years had been believed to emulate a skillful hand operation. Recent studies applying to problems of friction and wear, the heat treatment and

selection of new steels, flow patterns created in poorly designed pipe systems for conveying fibers by air, have been shown to benefit the industry. During the last five years I have written a number of articles to show underlying conditions and governmental policies which contribute to the present status of the industry in the United States. Some of these articles have been inserted verbatim in the Congressional Record."

Please send in your news items—Thank you for your cooperation.—*Max Seltzer*, Secretary, 87 Ivy Street, Brookline, Mass. 02146

19

Alex Wiren has just returned from a two year's residence in Majorca, Spain. This spring semester he will be a lecturer on business management at Dowling College (formerly Adelphi-Suffolk College, Oakdale, Long Island). He will represent M.I.T. at the inauguration of Dr. Allyn P. Robinson, the first president of Dowling College. His current address is 37 Hollywood Drive, Oakdale, N.Y. 11769.

K. A. Wright is retired and living in an antebellum home in Vicksburg, Miss. He and his wife worked on it for ten years prior to retirement. . . . *Frank Reynolds* writes that he and his wife enjoy good health and are living in Venice, Fla. They have recently returned from a most interesting plane trip around South America. . . . *Harry Cikins* is semi-retired and keeps fairly busy as a life insurance consultant.

Leighton B. Smith and his wife have a hobby of photographing birds in their natural habitat. This winter he is going to the Everglades where he hopes to add some new species to his collection. Previously they have visited Michigan, Utah, northern Maine, Southern New Jersey and Machias Seal Island.

Karl Rodgers' permanent address is in care of his daughter, R.F.D. 3, Box 430, Boonton Ave., Boonton, N.J. 07005. However, he has winter headquarters at the Lazy B Trailer Park, 1321 Austin Highway, San Antonio, Texas, and is often in Provincetown in the summer.

Herb Best and his wife have been absent from Majorca for about 6 months. They went first to Zurich, thence down the Rhine to Rotterdam, boarded the S.S. *Statendam* and twenty-one days later arrived in Los Angeles, Calif. They stayed at Laguna Shores. In February they went to Mexico for a month or two and expect to be back in Majorca in June.

We regret to report the death of *Jesse Stam*, Watertown, Maine in April, 1968.

Bob MacMullin and his wife live in Lewiston, N.Y. In May, Bob returned from Korea, having managed a successful start-up of the Oriental Chemical In-

dustry soda ash plant at Inchon. This was his sixth and last trip to Korea over the past four years. Bob gave a paper on the use of computers at the Tripartite meeting of the Chemical Engineers at Montreal, and attended the Army Research sponsored symposium on Electro-organic chemistry at Duke University. He is now working on another paper for the next Electrochemical Society Meeting in New York. They have three children: Mrs. Hypia, of Greenwich, Conn., who is married to a professional writer; Mrs. Aust, whose husband is chairman of the Department of Surgery at the new medical school of the University of Texas at San Antonio; and son, Bob, who is in charge of the computer office at Western Supply Co., at Tulsa, Okla.

Carlos Krebs' sister sends additional information about Carlos who died August 22, 1968. He graduated in naval architecture and mechanical engineering. Carlos and his father invented and perfected an automatic oxyacetylene cutting machine. He had trouble with his eyes, but at the time of his death he was writing a book in French on Medieval French Art and Culture. He also taught two days a week in Boston—higher mathematics and drafting at a trade school.

I.E.E.E. Fellow

Charles E. White, 32 Standish Road, Watertown, Mass., was elevated to the grade of Fellow in the Institute of Electrical and Electronics Engineers as of January 1, 1969. The grade of Fellow is the highest membership grade in the I.E.E.E. which is conferred upon persons of outstanding and extraordinary qualifications in their particular fields. White received his election for contributions to the organization and development of standardization activities in support of the national measurement system.

A dinner in New York on January 14th for alumni in that vicinity was attended by *Oscar de Lima*, *Bill Langille*, *Izzy Paterson*, *John L. Riegel*, *Don Way* and *Dean K. Webster*. Everyone is urged to write to their special friends in the Class urging them to come to the reunion. We are very happy to report that President and Mrs. Johnson have

accepted our invitation for cocktails and dinner at Chatham Bars Inn on Saturday, June 14th. Plan on attending and send in your reservations now.—*Eugene R. Smoley*, Secretary, 30 School Lane, Scarsdale, N.Y. 10583

20

A card from our world roving ambassador, *Harry Kahn*, sends greetings from the Philippines where he is stationed (for six months) at the provincial capital of Bacolod City doing his expert ceramic stuff for the I.E.S.C. at a ceramic tile plant. The irrepressible Harry arrived there from India and Thailand where, no doubt, he was performing equally valuable work for the ceramic industries in those distant parts. Harry comments that the weather in January is "cool, about 80 degrees" and he is heading for the beach.

A welcome letter from *John De Meulenaer*, of 21 Owencroft Road, Dorchester, Mass., says that he is now retired completely from his consulting engineering activities and enjoying it. . . . Our popular classmate, *Ming Pai*, still holds forth in Washington, D.C., address 2475 Virginia Ave., N.W. . . . *Myer Saxe* lives right in the heart of the "new Boston," Apt. 7-H, 790 Boylston St. . . . *Arthur Farrington* is located in Randolph Mass., address—76 Orchard St.

50th Reunion

As news of the approaching Golden Anniversary Reunion reaches you, your Secretary confidently expects a surge of mail giving assurance that you will be among those present. Writing these notes from California where Amy and I just managed to beat the blizzard that would have had us grounded for several days, we observe that time has a habit of accelerating, the older we get. So we suggest that with the reunion "only" a year or so away all of use had better start making plans. A few days ago, *Ed Ryer* came up from Florida to tell us of his plans and progress to date and the result has been put in a letter which you may have already received or, if not, will be getting shortly. Once you get the story we anticipate that you are going to be as eager to participate in this glorious event

as the rest of us. Let us hear from you.—*Harold Bugbee*, 21 Everell Road, Winchester, Mass. 01890

21

Spring is a reminder that Homecoming is not far off—the former Alumni Day celebration—and this is an invitation to you and your wife to join the large '21 group which gets together on campus in in Cambridge every year. The dates are Sunday and Monday, June 15 and 16, 1969. Many are adopting the habit of staying at the Charter House on Cambridge Parkway, not far from the Institute, and meeting for dinner there on Sunday evening. When you read this you will probably have official notification and we urge you to make reservations promptly. Not only will you find the events of the day enjoyable but you will also have another fine opportunity to renew acquaintance with a lot of close friends and, above all, to see the almost unbelievable changes which have taken place in the M.I.T. we knew—internally and externally. Please come see the gang!

Explorers' Club award

Outstanding awards are constantly going to famous men of '21 and it is our great pleasure to record the latest in a long list. On March 28, *Elliott B. Roberts*, Captain, U.S. Coast and Geodetic Survey, retired, was signally honored by the Explorers' Club as the recipient of the Edward Cleaveland Sweeney medal. This happy event was celebrated at a formal dinner meeting of a thousand members and guests at the Waldorf Astoria, New York. In the words of the Club's president, Dr. Walter A. Wood, the presentation recognized "... your manifold contributions to human knowledge throughout your professional career in the coast and Geodetic Survey. It also expresses the Club's profound admiration for the stature that you have brought to the *Explorers' Journal* during your many years of editorship." Elliott's award is named for the late president of the Explorers' Club, a prominent lawyer, government counsel, naval officer, author, and world wide explorer who reached the South Pole. The medal has been given only once before, to Dr. Matthew Stirling,



E. B. Roberts, '21 O. L. Bards, '21

past director of the Bureau of American Ethnology, Smithsonian Institution. A native of Roslindale, Mass., Elliott joined the Class of '21 via Lowell High School. At M.I.T., he was a member of the varsity track team, the cross country team, trip manager and executive committee member of the Civil Engineering Society and active in the Aero Society and the Chess Club.

Upon graduation, he joined the U.S. Coast and Geodetic Survey, where he soon became executive and commanding officer of Survey vessels on field assignments to east and west coasts, the Philippines and Alaska. He became chief of the division of geophysics and was given charge of the nation's first earthquake research program, which developed a network of seismographic stations and a tidal wave warning series. He was later assistant director of research and development, a post he held at his retirement in 1963. He had been a member of the national Research and Development Board, also of the U.S. Committee for the International Geophysical Year and official U.S. delegate to various international scientific congresses.

He is widely known as the author of several books and numerous scientific papers on such topics as tsunamis, offshore charting, and sonic methods for surveying and navigation. He invented a radio measuring device and has credits for his photography, some of which has been seen in *Technology Review*. A popular speaker, he has appeared on radio programs and he directed a program to aid architects in earthquake areas to build structures designed to withstand the severe stresses of earth tremors. In retirement, Elliott has carried on consulting in surveying, mapping, geodesy and geophysics, besides continuing his writing and, for the past seven years, as editor of the *Explorers' Journal*. The Department of Commerce awarded him its Meritorious Service medal. Besides the Explorers' Club, his memberships include the American Society of Civil Engineers, American Geophysical Union, American Association for the Advancement of Science, Seismological Society of America, Washington Academy of Sciences, Philosophical Society of Washington, Society of American Military

Engineers, the Cosmos Club and the Authors' League. For recreation, he admits to landscape painting. Rebecca and Elliott have a married daughter, Nancy R. Cross, and two grandchildren. The Roberts make their home at 4500 Wetherill Rd., Washington, D.C. 20016, where our congratulations are directed.

Fiesta

The delightful 1969 Interim Reunion of the Class of '21 in Mexico during mid-March, warmed the cockles of our collective hearts and was thermally welcome outside, too! It was held in conjunction with the 21st annual Fiesta of the M.I.T. Club of Mexico City and constituted our fourth interim reunion outside the U.S.A.—three in Mexico and one in Cuba. Hurred phone calls just before we left added the names of Olive and Ollie Bards, Sumner Hayward, and Beryl and Dana Kepner to the list of prospective attendees. Tantalizing cards and letters have been winging their way from south of the border to less fortunate classmates who didn't make the trip. Publication schedules and our wholehearted adoption of the "mañana" way of life will defer a report until a "late late" issue of the *Review*.

'21 Amity Fund leaders

At the moment of writing these words, the Class of '21 leads all other reporting units among the classes and graduate school courses in the total dollar giving to this year's Amity Fund. Thanks go to you, dear classmate, for your generous support, and congratulations are due our hard-working Class Agents, Ed Farrand and Ed Dube, and to Irv Jakobson's alert 50-Year Gift Committee, for the total of \$94,738 from 140 donors to this date!

Railroad Man of the Year

John W. Barriger, who, as "Traveling Freight Agent—and President," is sparking an amazing comeback of the once-moribund Missouri-Kansas-Texas Railroad at an age when many men have retired, has been named "Railroad Man of the Year" for 1968 by a panel of nationally-known transportation experts which aided *Modern Railroads* magazine to select the one who did the most for the railroad industry. The recognition accorded to John shows that age need not limit creativity. As president of the

Monon, he made it the first all-diesel railroad. He retired from the presidency of the profitable Pittsburgh and Lake Erie Railroad in 1964 at the mandatory retirement age.

The magazine comments that John could then have chosen a well-earned, more relaxing life but, when the opportunity arose to assume a third presidency which posed a tough combination of problems in management, finance, technology and personal leadership that would have toppled many younger men, he jumped at the challenge. He found funds to rejuvenate the withered Katy; he boosted the morale of its personnel. The trains ran on time again. Business has come back to the Katy. One of the panelists who selected him said that John's distinguished career proves that a man skilled in original thought and exposition can also be a practical man of affairs at the highest level. His revival of the Katy is only the latest of many accomplishments.

Travelers

Besides the stamps they sent from Greece, we now have an ash tray from Mt. Zion, Jerusalem, decorated with current Israeli stamps, sent by Merge and Jack Kendall as a grand souvenir of their recent trip. Helen and Ray St. Laurent have shared with us the Kendall's letter to them, relating visits to four of the seven architectural wonders of the world—the Taj Mahal, the Pyramids, Baalbeck in Lebanon and St. Sophia's in Istanbul. The Kendalls toured Japan, Hong Kong, Singapore, Angkor Wat in Cambodia, Bangkok, the Himalayan range from Everest to Katmandu (by air), Ispahan and Persepolis and the Ghats on the Ganges. They spent much time exploring Greece, where they visited the Greek theater and the 5,000-seat Roman amphitheater in Epidaurus, Corinth Mycenae, and took a cruise on the Aegean Sea from Athens to several islands. On the return journey through Rome, they stopped in Dubrovnik, Yugoslavia. They are resting from their travels at 401 Hermosa Pl., S. Pasadena, Calif. 91030.

Avid golfer

Oliver L. Bards, 2627 Grandin Rd., Cincinnati, Ohio 45227, started working at

the age of ten for his father's firm, the E. H. Bardes Range and Foundry Co. After our graduation, he worked at almost every job in the company, becoming its president in 1943. He "retired" in 1950. Inaction in Florida (or was it golf?) lasted just six weeks! The challenge of action was so strong, he went back to develop a diversified manufacturing operation, the Bardes Corporation, of which he is president and director.

Anyone who knows Ollie or has watched him at our reunions has discovered his predilection for golf. He has a driving range par three course for employees at the main plant in Cincinnati and he indulges in the games as often as he can get to his home in Palm Beach, Fla. He plays at almost every stop on trips abroad, especially when he can visit Scotland, where he holds membership in both the Caroustie Golf Club and the Royal and Ancient Golf Club of St. Andrews, that dour and doughty daddy of them all. Little wonder that, with the advent of the Barades Realty Co., golf would have priority in its planned three-phase development of a 900-acre tract in the Seminole area off Starkey Rd., St. Petersburg, Fla. Half of the first 300-acre phase was formally opened last October 31—the championship, par 71, 18-hole, 6,873-yard course of the Bardmoor Country Club, 8000 Bardmoor Blvd., St. Petersburg-Largo, Fla. Designed by famed golf architect William Diddell, the course boasts artfully alluring lakes and woods, an excellent clubhouse, driving range, and other top-notch facilities.

The derivation of the name of the club will be obvious: the crest designed by Olive combines the coats of arms of her Merrill family and that of Ollie's. Under way for the balance of the first development phase is the initial 48-unit condominium in an adjoining area which is to have a recreation center, town and detached houses and a small shopping center. Ollie says he has reserved the house nearest the first tee. He and Olive entertained Graciela and Helier Rodriguez at the Bardmoor inaugural ceremonies. When not indulging in his avocation, Ollie can usually be found in Cincinnati, directing the widespread entities of the Bardes Corporation, IlSCO Corporation and IlSCO of Canada make a varied line of copper and aluminum electrical connectors. At five locations in the U.S. and Canada, the Wheel Trueing Tool Co. makes an assortment of diamond tools for dressing grinding wheels, drill bits for mining and masonry and related equipment. The Cook Well Strainer Corp. makes industrial well strainers and screw machine parts. There are companies in other fields in Canada, England and France. Besides serving as director of all of these firms, Ollie is also a director of Cole National Corp., Electronics Capital Corp., and Greenwich House.

His memberships include the Society for the Advancement of Management, Four Arts Society, Philosophical Society and the Necomen Club of North America. He

is a trustee of the College Preparatory School and the Seventh Presbyterian Church of Cincinnati. He serves M.I.T. as a member of the important Corporation Development Committee. Sons Oliver and David are both married; they own and operate their own business. Merrylin is married and Mary Brittain is a senior in college. There are eight grandchildren. Ollie tells us he often sees Helen and Miles Zoller of Jupiter, Fla., and has also seen Mrs. Zambry Giddens in Ft. Lauderdale. He reported trying to reach Dick Windisch, who has retired to Florida.

Mr. and Mrs. Sumner Hayward, 224 Richards Rd., Ridgewood, N.J. 07450, have announced the marriage of their daughter, Priscilla, to Mr. Joseph A. Crago, on January 25, 1969, in Albany, N.Y. Priscilla has a B.A. from Swarthmore and a master's in educational psychology from Rutgers. She is studying for a doctorate at the State University, Albany. She heads a department of the N.Y. State Department of Education in Albany. Her husband is a certified public accountant and they will live in Albany.

Eddie and George F. Gokey, Jr., 98 Westminster Dr., Jamestown, N.Y. 14701, have written welcome notes to both Ray and your Secretary, telling of the delights of their customary winter quarters in St. Maarten, N.W.I. They write of meeting M.I.T. Emeritus Professor John Chipman and also Benny Goodman there. Says George, "We arrived without being hijacked to Havana!" His card shows the ruins that were once Ft. Amsterdam which, he explains, was where Peter Stuyvesant lost his leg. And we always thought it was down in that tough East Side New York neighborhood near where we went to Stuyvesant High School!

No sooner did we report on the good post-operative conditions of Ray St. Laurent, Irv Jakobson and Chick Kurth, than Ted Steffian, Assistant Secretary, wrote that he had had two hospitalizations. Ted is back at his architectural and planning offices but says his schedule is devoid of excessive activity—the reason he and Lovina didn't go to Mexico with '21. We hope all these fellows will soon be "in the pink."

Deceased

Maxine and your Secretary were severely shocked to learn from Don Severance, '38, before our departure for Mexico, of the death of Harold C. Pearson, '23, at his home, San Carlos 86, Mexico 20, D.F., Mexico. On behalf of their host of '21 friends, we express heartfelt condolence to Conchita, to Harry's family and to the Class of '23.

It is with profound sorrow that we record the passing of four members of the Class of '21 and extend to their dear ones sincerest sympathy from the entire Class.

Ditlef Johannes Fürst Hald, of Meltzers Gate 5, Oslo 2, Norway, died on June 27, 1968. He was born in Oslo on July 9, 1889, and earned the S.B. degree

in 1908 and the C.E. degree in 1912 from the Oslo Technical Institute. He had spent his entire professional career, from 1913 to his retirement in 1959, with the Norwegian State Railways, rising through the ranks to become assistant superintendent, division engineer and chief engineer. He came to the U.S. in 1920 with a fellowship from the State Railways and the American Scandinavian Foundation in New York, spending three with us as a special student without a fixed course. He then traveled for six months, crossing Canada and the U.S. three times, in the solution of specific tasks for his company, and returning home via the Panama Canal. He is survived by his wife, Mrs. Inga Hald; a married daughter, a lawyer and graduate of Oslo University; a married son, a mining engineering graduate of Norway Technical Institute, and five grandchildren. At the time of our 45th Reunion, Mr. Hald wrote that he remembered with pleasure the good days he spent at M.I.T. and expressed his appreciation for the continued receipt of letters from the Class.

Francis Joseph Magee, Colonel, U.S. Army, retired, of 2206 Northeast 16th St., Bal Harbour, Ft. Lauderdale, Fla. 33305, died on August 7, 1968. A native of Taunton, Mass., he was born on August 30, 1898. He was graduated from Taunton High School and the U.S. Military Academy, West Point, and was associated with us in Course I. At M.I.T., he was a member of the swimming team. He also attended the Army General Staff and Command School at Ft. Leavenworth and held the master's and doctor's degrees. In 1923, he became division engineer for the New England Telephone and Telegraph Co., and in 1927, he joined the department of public works of the Commonwealth of Massachusetts, where he was assistant chief engineer of design and construction at the time of his retirement in 1958. Since moving to Florida, he had continued active as a consultant. He was the author of several civil engineering manuals. He was a veteran of both World Wars, serving on General MacArthur's staff as director of the military communications division for the Signal Section, General Headquarters of the armed forces in the Pacific theater. He was awarded the Legion of Merit and Commendation medals and received three presidential citations. He was the commander of an American Legion post and a member of the Retired Officers' Association, the Association of Graduates of the U.S. Military Academy and the Coral Ridge Yacht Club. Active in tennis and golf, he spent most of his leisure time in power boating. Col. Magee is survived by his wife, the former Helen Reynolds of New York City.

Watts Sherman Humphrey or 65 Cleveland La., Princeton, N.J. 08540, died on August 20, 1968. Born in Saginaw, Mich., on December 13, 1896, he prepared at Exeter and Princeton. During World War I, he was in the Air Service. At M.I.T., he was a member of Delta Kappa Epsilon, the Beaver and Walker Clubs, Alpha

Chi Sigma, the gym team and its captain in our junior year, the wrestling team, the Athletics Advisory Council and the M.I.T. Athletic Association. He was graduated with us in Course III and became associated with the Hanna Ore Mining Co. as a mining engineer in Hibbing, Minn. He later went into the insurance field and became president of Analytical Research Bureau and financial vice president of the General Reinsurance Corp., New York City. During World War II, he served for five years in the Eighth Air Force and on the combined operational planning board, attaining the rank of colonel and earning the legion of Merit and Bronze Star awards. He then served in the Chicago headquarters of the C.I.A. before entering the investment counseling field and opening the Princeton office of Laidlaw and Co. as its manager. His memberships included the Nassau Club and the Pine Brook Tennis Club. He is survived by his wife, the former Winifred Rowley; five children, Dr. Philip S. Humphrey, Amherst and Michigan, Watts S. Humphrey, Jr., Chicago and Illinois Institute of Technology, William M. Humphrey, Illinois Institute of Technology and Maryland, Miss Dorothy M. Humphrey, Princeton, and Peter Rowley, Princeton; two sisters Mrs. John T. Sample and Mrs. Patrick Tober; a brother, George Humphrey, and six grandchildren.

Charles Francis Baish, Colonel, Corps of Engineers, U.S. Army, retired, of Washington, D.C., died on August 28, 1968. Born in Olean, N.Y., on January 29, 1897, he was graduated from the Sharon (Pa.) High School. He attended Catholic University, Washington, and was graduate from the U.S. Military Academy, West Point. He was graduated with us in Course I and, years later, he obtained the master's degree in education from American University. During World War I, he was a company commander at Ft. Belvoir and in France. In World War II, he was commander of the 42nd Engineer Regiment, Camp Shelby, and post commandant at Juneau and Yakutat, Alaska, where he was responsible for initiating and constructing Alaskan and Aleutian Islands defense facilities. He was also group commander of the Ft. Lewis Engineer Training Center and chief of staff, Army Service Force Training Center at Ft. Lewis. From 1950 to his retirement in 1954, after 40 years of Army service, he was Professor of Military Science and Head of that Department at M.I.T. Besides serving on the M.I.T. faculty, he had previously taught at West Point for six years and for four years at the Industrial College of the Armed Forces, where he had also been chief of the manpower division. He held the Army Commendation Medal and numerous service ribbons.

Following his retirement from the Army, he taught mathematics at Walt Whitman High School in the Washington area and, from 1955 to his retirement in 1966, he was head of the mathematics department at Bethesda-Chevy Chase Senior High School, Bethesda, Md. He had been vice president of the Boston Chapter, Society

of American Military Engineers; secretary-treasurer, West Point Society of Boston, and president of St. Joseph's Holy Name Society, Belmont, Mass. He was a member of the Elks, the Fourth Degree Knights of Columbus, an honorary member of Pershing Rifles and an associate member of the Scabbard and Blade Society. His wife was the late Adelaide Flournoy of Washington, D.C., and he was predeceased by a daughter, Mrs. Marie Oristian. He is survived by two daughters, Mrs. Sheila B. Johns of Orlando, Fla., and Mrs. Olivia B. McFadden of McLean, Va.; a son, Lt. Col. Charles F. Baish, Jr., of Washington, D.C.; two sisters, Mrs. John N. Stone, Annapolis, Md., and Mrs. Patrick H. Tansey, Arlington, Va.; a brother, Faber Baish, Sharpsburg, Pa., and 15 grandchildren. We acknowledge a warm letter from Mrs. McFadden for the Class' expression of sympathy and we are indebted to her for aid in preparing these notes.

Make your plans

As soon as you finish those April chores for Uncle Samuel, paste these dates in your hat and set about making plans and reservations now; Alumni Regional Conference, St. Louis, April 12; Alumni-Student Weekend, Cambridge, April 18-19; Homecoming (Alumni Day), Cambridge, June 15-16; 50th Reunion, Class of '21, Cambridge, June 10-14, 1971. Please write your secretaries and include the personal data sheet if you didn't return it for the last reunion. If your news hasn't appeared in these columns recently, we urgently need your help. Write now!—*Carole A. Clarke*, Secretary, 608 Union Lane, Brielle, N.J. 08730; *Edwin T. Steffian*, Assistant Secretary, Steffian & Bradley, Inc., 19 Temple Place, Boston, Mass. 02111; *Sumner Hayward*, Assistant Secretary, 224 Richards Road, Ridgewood, N.J. 07450

22

Here we are back in Buffalo from sunny but chilly Phoenix, mowing down piles of accumulated mail and reminiscing about the lovely evening with Hardy and Jack Liecny at "Cactus Patch." Our trip on the torturous gravel road around cliffs, through Tortilla Flat, across Superstition Mountain to Roosevelt Lake and Dam was especially exciting—made more so by a car and trailer which we found extending across the highway from mountain to cliff—all performed without personal injury. We enjoyed the plane trip over Oak Creek Canyon, Flagstaff, and the Grand Canyon. We were thrilled by the Parada del Sol by the Scottsdale Junior Chamber of Commerce preceding the Rodeo, with bands, beautifully equipped horses and costumed riders as well as floats of all descriptions including a real, live, working blacksmith shop. Now Dorothy wants me to go to Florida to rest from our constant activities in Arizona! Buffalo still has no snow but we have heard that Boston, New York and other places have been more generously

favored. However, our skiing on the southern hills has been perfect.

Oscar Horovitz and Mrs. H. drove to Florida in January carrying three films on Russia, Israel and President Howard Johnson's inauguration. His new business address is Lee Crane Service, Inc., 45 Gerard St., Boston, Mass. 02119. Oscar is pictured in the *Newton Graphic* as they announce his narration and film "The Miracle That is Israel" for the New Century Club at the Sidney Hill Country Club. They describe Oscar in glowing terms as the only American 5-star Motion Picture Exhibitor in the Photographic Society of America and the winner of 91 awards in national and international amateur competitions.

Another item has been received regarding the retirement of traffic expert **Nathan Cherniack**, one of the world's pioneer traffic engineers of the Port of New York Authority. One of his early assignments was to participate in a survey to determine whether there would be enough traffic volume for toll bridges between Staten Island and New Jersey. He now states that computers are indispensable in his calculations.

Bob Tonon is a director of Associated Industries of Massachusetts. Bob is President and Treasurer of Peter Gray Corporation of Cambridge and President of Barbour, Stockwell Co., and National Products Corporation. He is a trustee of the Cambridge Savings Bank, former President of the Boston branch of National Metal Trades Associated and former Vice President of the Cambridge Chamber of Commerce. We are always happy to see Bob at our mid-winter, spring and summer reunions.

We are indebted to **C. Yardley Chittick** for his note regarding his trip with Ruth to the Windward Islands to help friends bring their boat northward from Granada. Yard reports a very interesting trip but extremely hot weather in the southern latitudes. He also enclosed a quotation from **Charles E. Brokaw** of Denver. Chuck wrote: "I never guessed retirement would keep me so busy. Have had a flock of meetings including three days at Snowmass at Aspen so far this year. The skiing there was great to watch—also the golf course. Have had several good rounds as January has been very mild here. Have had some interesting consulting assignments so far and hope for more in the future. One at a steel mill in Indonesia could prove very profitable."

Again thanks to **Dale Spoor** of Richmond for his information enabling us to find the Liecny's in Phoenix. Jack had just recovered from a small repair job in the hospital and was looking and feeling fine—still planning on their trip to the Mexican Fiesta.

Walks 100 miles a month

Chester W. Greening of Westport, Conn., has written a conversational letter about his experiences and memories. He has been in Westport on Long Island Sound

for six years since retiring from Alcoa, wondering how he found time to go to work. He writes: "Our limited travels take us through glorious New England, winter and summer, and occasionally to New Jersey, Akron, Ohio and to California to visit our son Tom who is a partner in a successful clinical psychology firm in Los Angeles where the problem is keeping up with the many clients generated in that climate. Tom will visit us in July when he will be Dean of a division of the National Training Association of Washington, D.C., which holds an annual training course in Bethel, Md. My regular walks along the shore and marshland add up to 100 miles or more monthly—less than the late John F. Kennedy's prescription. My company consists of two or three dogs, the slap of the waves and the sight of mallards, Canadian geese and Whistling swans. I marvel at the graceful flight of the swans, whistling as they go like tired old steamboats. Would that Crawford Greenwalt, of Humming bird fame, would record them!

"Walking will be followed by rowing the Queen Alice II, and ordinary row boat which replaced a 50 hp outboard. In my almost daily rowing I assume racing shell form learned in the spring of 1919 when *Horace McCurdy* was vigorously extending his University of Washington experience for the benefit of M.I.T. on the Charles. *Ford Blanchard*, another short term oarsman, spent a recent week-end with us. He, having recently become a retired Washington bureaucrat, brought up his concern about retirement activity which we promptly disposed of with a 'Stein on the table.' Ford is no handier with his Mercedes than he was with the Mercer which he bought from the late Alan Bowers and in which we attended our Fifth Reunion at Falmouth. If you don't like your gas bill, Ford will negotiate it for a fee, having had this experience with F.P.C.

"*Royal Stone* of New Fairfield, near-by and our better halves went to a Fairfield County M.I.T. dinner in Westport. We listened to Dr. Siefert, assistant dean of the School of Engineering, tell us about future modes of travel. It is my decision to continue walking and rowing. I used to see *Webb Maschal*, who lived in Norwalk until a year ago, when he had an eye operation and moved to Laguna Hills, Leisure Village in California. I trust the climate and scenery is kind to his eyes. I do want to ask *George Dandrow*, how the new shingles on his little house on Chatham Harbor, Cape Cod, are holding up. Our classmate, the late *George Hopkins*, our neighbor when we had a little place in Orleans on the Cape, predicted that the fog was always so thick in Chatham that the carpenters couldn't see the nail heads.

"*The Money Game* by Adam Smith is a most entertaining book, containing financial wisdom as well. He refers to the successful moonlighting of a professor by the name of Irwin who was

handy with computers. Could that be our own 'Million Dollar Schell'?

"Having grown up in Bridgeport and Fairfield before going to Cambridge in 1918 and not seeing much of the area since that time until six years ago, it has been heart-warming to be welcomed by many old friends after forty-odd years. Hippo Wilnot who worked with *Don Carpenter* and the late *George Clifford* at Remington Arms in Bridgeport provides a 75 hp outboard in which we chase the big blues in season. So life is good to us in Westport and the stein is always on the table for 22'ers. Sincerely, Chet Greening." Thank you, Chet, for your most interesting comments. We hope this encourages others to pick up a pen.

Impending official visit

Your secretary acknowledges the new address of *Carl B. Braestrup*, Guilford, Conn., as he fills out his immunization forms and visas for Czechoslovakia, Yugoslavia, Hungary, Romania, Denmark and Holland, a Buffalo Trade Mission, during April. Classmates in these countries should be warned of the impending official visit! The colored slides will be on display for any one of you who arrive in Buffalo during May and June. By then, we will have all recovered from our winter vacations.—*Whitworth Ferguson*, Secretary, 333 Ellicott Street, Buffalo, N.Y., 14203

23

By the time you fellows read this column, at least ten of us will have journeyed to Mexico City to enjoy the sights, sounds and savors of ancient and modern Mexico and their annual Fiesta in particular. As of the time of writing, at least the following should have made it—*Herman Bruson*, *Walter Dietz*, *Louis Domingues*, *Herb Hayden*, *Dave Kaufman*, *Forrest Lange*, *Lloyd Lockley*, *Bert McKittrick*, *Dave Skinner*, *Roscoe Smith* and Colonel *Walter Richards*. From preliminary info I think most of them took along their wives. *Dave Skinner* mentioned taking along five (5) others. Yours truly was obliged to cancel at the last minute because of some professional commitments that developed unexpectedly. I will really try to make this affair another year. Will each of you who went please give me a few words on what you liked best about your safari to Mexico. I need more copy!

Michael Drazen writes, "Still busy serving as Consultant to industry requiring large blocks of electric power for chemical and steel production. My services relate primarily as negotiator for special rates and contracts with electric utilities that are willing to recognize . . . arc furnaces as desirable loads."

Herb Hayden writes, "We are both just over the 'bug.' Not too good for several weeks after Thanksgiving. I keep busy—bowl in two leagues each week, play hockey 2 to 3 times per week, get in a

little bridge occasionally. Am enjoying retirement but it is strenuous as I play tennis during the summer. . . ." Physical fitness personified! Sounds great Herb. You should live to be 110!

Myles Morgan writes, "Have been retired for a year but am still chairman of Morgan Construction Co. Have four children and twelve grandchildren." Our progeny march on and on—both original and secondary! . . . We see from the *Wall Street Journal* that *Roy G. Rincliffe* is one of the four directors of INA Corporation who resigned their positions to clear the way for this company's proposed acquisition of World Airways Inc., in compliance with Civil Aeronautics Board regulations. Roy, chairman of Philadelphia Electric Co., is also a director of the newly merged Penn Central. Congratulations to you on your achievements, Roy! . . . *William S. Wise* tells us "I have retired from (the) Connecticut Water Resources Commission and am associated with Charles A. Maguire and Associates, Providence, R.I., as a Consultant."

To benefit industry

Our classmate, *Alfred F. Perlman* has hit the news again. Our Class seems to be very well represented in the management of Penn Central. Al said recently to news people that the New Haven takeover will benefit New England industry through better freight service. Penn Central, he said, with their knowhow and routes as far west as St. Louis and into the South will open new markets for industries of the north-east. We infer from reading the article in the Portsmouth (N.H.) *Herald* that passenger and in particular commuter service still must await public support. We sympathize to a degree with the plight of our once supreme common carriers of people in making that traffic pay but since some must still travel by rail must all of the amenities such as porter service disappear completely from terminals like Grand Central? Supermarkets with their baskets on wheels solve the grocery lugging problem. I would gladly pay 50 cents or a buck to rent one of these in G.C.T. A source of revenue, Al?

Forrest Lange, our avid clipping sender, this time from the Boston *Sunday Globe*, advises the engagement of Miss Ann Cary Stratton, daughter of Dr. and Mrs. *Julius A. Stratton*, to Lew Finch Boyd, son of Dr. and Mrs. David P. Boyd of Wellesley Hills, Mass. Reading further we see that Ann is a graduate of Radcliffe and Lew of Harvard, Mr. Boyd is an assistant to the Director of Development of our own Institute. We wish you much happiness Ann!

We see from *Industry*, November 1968 issue, that our friend *David W. Skinner* is one of the Vice Presidents of Associated Industries of Massachusetts. . . . Also, a news release from The Proprietary Association of Washington, D.C., tells us that *Joel Y. Lund* has been appointed as a Consultant to the Office of Emergency Preparedness, an organization within the

Executive Office of the President "which provides leadership and coordination on non-military emergency mobilization preparedness." After graduation from the Institute Joel was granted an honorary Doctor of Science degree by the St. Louis College of Pharmacy.

Dr. *Julius A. Stratton*, Chairman of the Ford Foundation, in commenting on the recent release of the report on its study of the nation's needs and opportunities relating to the oceans of the world stated "that a vigorous, systematic investment in the oceans will yield a tremendous return over the years ahead." The commission, which Julius also chaired, was composed of fifteen members from Federal and state governments, industry, universities and marine laboratories and was appointed by President Johnson in January, 1967.

Dorothy W. Weeks who received her M.S. and Ph.D. in physics from the Institute was recently honored at a party given in her honor by the Wilson College Club of Greater Boston. She held the position of Professor of Physics at Wilson College from 1930 to 1956 and was most active in the affairs of the Boston alumnae group. The Boston club recently raised \$10,000 for a physics laboratory at the Wilson Science Center and named it in her honor.

Classmates deceased

We are indeed sorry to learn of the deaths of five more of our classmates. Particulars are all too scanty but as soon as we have more we will advise.

Harold G. Crowley, 3044 Cambridge Pl., Washington, D.C. 20007—October 25, 1968; *Carl J. Conkey*, Box 2681, Marathon Shores, Fla., 33052—October 14, 1968; *Ernest A. Davis*, 111 Little Hill Dr., Stamford, Conn. 06905—November 17, 1968; *Dean Lewis K. Downing*, 3301 13th St., N.E., Washington, D.C. 20017—October 19, 1967; *Harold C. Pearson*, San Carlos 86-3, Mexico 20 D.F., Mexico—January 24, 1969.—*Thomas E. Rounds*, Secretary-Treasurer, 25 Ridge Road, Danbury, Connecticut 06810

24

Evidently the International Executive Service Corps has a very definite appeal. We told you that Howard Whitaker had gone to Korea. Now *John Fitch*, who had hardly come home, is off to South America again, this time to Colombia.

Paul Cardinal, demon IESC recruiter, has not sent himself out of the country; but after he and Lorene both were laid low by Hong Kong flu, they did send themselves to Florida for a month or so. This time no one asked him to drive a car back.

The Ambachs returned from Bermuda long since, but Russ still thrills at the memory of "tearing along Bermuda's narrow highways on a motorbike *And On The Left Side, Yet!* The few turnabouts

require extreme caution for anyone weaned on right side roadways. We have no information on the night club life of the Island, for we lived in a house right on Devonshire Bay and saw no need of duplicating what Miami or New York has to offer, when the Island is unique in the world with a limited number of birds, botanical gardens, spectacular water views, white terraced roofs, and precipitous coral bluffs." Besides, Russ was probably so worn out after all that daredevil motorbike riding that he couldn't stay awake long enough to go to a night club.

I. Henry Stern is another of those who have decided that the climate of Florida suits them better than that of New England and having just gone through the worst snowstorm to hit the Northeast in 10-plus years we can only think there is something to be said for that sort of thinking. Hap and Jan are now comfortably ensconced in their new home in West Palm Beach. They think by June they will be able to stand the New Hampshire weather at Bald Peak. . . . In January *Ray Lehrer* took a short trip to Puerto Rico. "At one of the hotels saw some excellent pictures of Liz and Jim Killian attending a party as part of *Luis Ferré* assuming the governorship. Luis was in the pictures too, and looked great. I did not see him though, as he was in Washington for the Presidential festivities." (Did you see the quick TV shot of the Puerto Rican car passing the reviewing stand at the Inaugural parade, with Luis waving happily like a true politician?)

Strengthening spiritual experience

Hadn't heard anything of the Reverend *Gertrude Harris* for some time, but now comes an item of news. Last fall she spoke to a meeting of women educators in Vermont about "Life's Eternal Values." You will remember that Gertrude, a Methodist minister, has been for some time on the staff of a Maryland center for the training of non-missionary individuals who are going on overseas assignments—doctors, nurses, teachers, technicians, and the like. (Sounds like a combination of Peace Corps and IESC with Methodist overtones.) Now it seems there is a second such center in Wells, Vt., and Gertrude is on the staff there as well.

She explains the special aspect of their training: ". . . (these people) come to the Institute knowing that they will face problems of unusual difficulty, and they wish to discover whatever there is of faith within themselves in order to strengthen their own spiritual experience."

Success story

"Cuban refugees write a U.S. success story." So read the head on a *Business Week* article in mid-January, and guess who headed the list? Here's the way the article began: "*Miguel Amezaga*, 64, who fled his native Cuba shortly after Fidel Castro's takeover on Jan. 1, 1959, took to the complexities of U.S. corporate life like many executives once took to

Havana cigars. Today he is a vice-president of St. Regis Paper Co. 'If there's been any problem at all,' says Amezaga, 'I'd have to say it's been difficult to adjust to the Chicago weather and the lack of domestic service.'

"In Cuba, Amezaga had a one-third interest in a company that did business exclusively with U.S. companies selling in Cuba, including St. Regis. When he came to this country, he didn't have to search for a job—he was offered one by St. Regis.

"Amezaga's experience is typical of that of other Cuban emigres who have done well in U.S. corporations. Those who have made it typically have been well-educated. Most attended U.S. universities (Amezaga went to MIT), and hence were fluent in English. They knew U.S. corporations first-hand because most major corporations operated in pre-Castro Cuba."

Bogus retirement

Through the years we've kept you up to date on some of the wanderings of *George Tapley*, but now comes a capsule history from George himself that brings it up to the moment and fills in some of the blank spots. "After an interesting and varied career in the U.S. Engineer Corps and with private consulting firms, which took me to the Southwest, Alaska, Burma, Thailand, Lebanon, and San Salvador, I retired in December 1965 to my home town of Haverhill, Mass.,—but immediately took on the job of City Engineer.

"Haverhill was settled in 1640 and has problems in common with other old cities, i.e., lack of foresight in planning and funds for maintenance. However, with the new Interstate Highway 495, an Urban Renewal Program in progress, the city's proximity to both the seashore and the mountains, and much of its 34 square miles still undeveloped, we look forward to attracting industry and people who want to get away from the overcrowded Metropolis. (Does it sound as though George is also working for the Chamber of Commerce?)

"I try to confine my interests to the engineering problems involved and let others mess with the political problems, which is a good way to keep out of trouble and get some real work accomplished.

"We are fortunate in having our daughter, who is married to a Haverhill manufacturer, and their three children living nearby. Son, George Jr., who is married and has two children, is the Director of the City Art Museum in Monroe, La., but he plans to change to full-time University teaching. We hope it will be in New England. See you at beautiful Lake Winnepesaukee in June." Right George, and you'll see a lot of other old friends there, too. Maybe you can get in a bit of Haverhill proselytizing.—*Henry B. Kane*, Secretary, P.O. Box 177, Lincoln Center, Mass. 01773

26

We have been reporting a snowless winter at Pigeon Cove with considerable monotony fully expecting that it could catch up all at once. It did. Last week end was the wildest we have known. The wind from the northeast remained in the 40 to 60 m.p.h. range for six hours and occasional gusts hit hurricane velocity. The sea was something to behold. Rushing at us below our granite cliff it seems as though we were riding it out in a very stable ship and comfortably protected in that ship. Comfortable until the wind and wet snow broke a wire somewhere (our's are underground) early Sunday evening. Then we suddenly became primitive. Ruth is a candlelight gal, so after finding a packet of matches the house was quickly aglow. From Sunday night TV we switched to FM battery radio but gradually the house cooled off. A new supply of fireplace wood arrived from New Hampshire three days before the storm so the fireplaces were pressed into service but the study that can be closed off soon became headquarters.

It was nearly noon Monday before power was restored but our boy scout breakfast wasn't bad at all—as a matter of fact, we found a better way to cook English muffins. The snow was wet, heavy and plenty but plowable and a jeep dug us out. However, the traffic problem which normally is just barely tolerable made it impossible to get into the city. Stalled cars by the thousand and unplowed or narrowly plowed roads brought about a complete snafu. Commuter trains went down the drain also. By Wednesday we made it, but even a week later travelling was slow. After such wildness the sea is calm this mid-February Sunday morning and the warmth of the sun streaming through the Thermopane put me to sleep in my chair as I was organizing thoughts. for the Notes. What better thoughts than those from *Gordon Spear* in Pompano Beach, Fla. "We found this house in 1967 which is more house than we actually needed but it's in a lovely quiet neighborhood outside the Pompano city limits just two blocks south of the Deerfield Beach line.

We are on a canal and plan to buy a small boat to cruise the intracoastal and the many canals. We love it here and plan to do most of our future travelling in the summer. Here you don't have the heating worries when you close up to travel. Just install your hurricane panels, shut off the water, lock up and leave.

"On our recent world cruise we spent nine days in India with Shantaru Kirloskar and his relations. Went to the Taj Mahal with Shantaru—also to New Delhi. We then went to Bangalore, Haribar and Modras. We saw every Hindu who has visited us in Michigan over the last 35 years. We had a wonderful trip and left the ship at Hawaii in December where we stayed four months in Honolulu. We visited most of the outer islands and loved Hawaii. It has the most even weather you could imagine and we plan to visit there again soon." Gordon retired a bit earlier than some of us and his letter indicates clearly how he started retirement. Many seem to do the same. Seek a warmer climate and do some traveling.

One classmate who so far has done neither is *Bill Latham*. From a recent article in the *Niagara Falls Gazette* we quote. "William H. Latham, resident engineer of the Power Authority of the State of New York, has been elected president of the Greater Niagara Frontier Council Inc., Boy Scouts of America. Mr. Latham resides at 5232 Fort Gray Drive, Lewiston."

News after 40 years

A back of an envelope from one who hasn't come out of the bushes in more than 40 years brings us up to date. Captain *Clifton B. McFarland* reports "Retired from the U.S. Navy in June 1967. Now with Tippetts-Abbott-McCarthy-Stratton as engineering advisor to the Royal Thai Government on a project for providing potable water to 600 rural communities in North and Northeast Thailand with headquarters at Khon Kaen, Thailand." Somehow I always connected "Mac" with the Army—guess it was his R.O.T.C. uniform and I used to wonder how anyone his age could be a captain in the Army but now I see it was the Navy.

Where is he now?

An address record form gives the following. "Arthur E. Larratt, P.O. Box 12, Redding, Conn." We have not seen or heard from Ted in years so I looked him up to see if he had remained in the aircraft field, since right after graduation and he was listed with Kaman Aircraft at Bloomfield, Conn. Ted, why don't you let us hear from you one of these days? . . . Another back of the envelope note (how useful they are to a class secretary!) from *Bill Graves*. "I believe that our class secretary already knows that I retired from the U.S. Smelting Refining and Mining Company in 1967 at age 65. Am now available and occasionally getting assignments as a private consultant in mining engineering." We believe that Bill still makes his home in Waltham, Mass., when not travelling on consulting assignments.

A similar note from *Mal Jenckes* will finish up. "Retired from Secretary, Security Insurance Co., New Haven, in 1963. I have been working from Insurance Company of North America, Hartford Service Office, since then, and am now continuing as Consultant to that office, having no desire to retire from business; currently doing the type of work I enjoy. My health has never been better, I'm lucky to say." The sun has swung around and is again caressing us through the window as we put together class notes. Before we are lulled into a mid-morning siesta we will say cheerio until May.—*George W. Smith*, Pigeon Cove, Mass. 01966

27

Our deepest sympathies go to *Frank Connolly*, whose wife, Isabelle Colvin Connolly, has died after her second open-heart surgery. Frank lives at 2911 Via San Geronio, San Clemente, Calif.

When *Louis F. Eaton* was a winter visitor in Florida, we reported that he had moved there. That was not the case, and he has also not moved to Sun City, Ariz., although he has also wintered there; his home is still Duxbury. . . . *Grenville Gerrish* continues, in his retirement, as design consultant for Diamond Interna-



C. W. Meytrott, '27 G. C. Houston, '27 R. M. Bigelow, '27

tional and Joy Manufacturing. He has been granted several new patents this past year. . . . *George Houston* has been appointed chairman of the Department of Continuing Education in Business—in the Center for Continuing Education at Northeastern University in Boston.

We haven't heard from *Glenn Jackson* in a long time but *George Houston* tells us that he is back from his consulting assignment in Recife, Brazil and is currently commuting to another client in New Jersey. . . . *Robert M. Bigelow* has retired, after 39 years of service, as Vice President and Director of United Shoe Machinery Corp., but will remain active on a part-time consulting basis.

Willard S. Felch reports he is "still with AT&T Long Lines Department in New York City." . . . Retired from Eastman Kodak, *Andy (Elmer) Andrews* continues to travel and is active in church, power squadron and Medic affairs. He has a son with Kodak—currently at Harvard Business School. . . . News is that *Ray Hibbert* is doing very well selling sophisticated plastics on a manufacturers' representative basis. I'm indebted to him indirectly for 12 little calendar strips which attach to the wrist-watch strap month by month. These were sent out by his company at Christmas.

I have a nice long letter from *Herbert M. Houghton*. Bert, whose wife is dead, has retired from the oil business in Canada and is living in Ventura, Calif. (1952 Vista Del Mar Road). He recently flew east, bought a car, and drove back west, trying to locate a few M.I.T. friends on the way. *Malcolm MacDuffie*, '26, *Larry Newman*, '29, and *Bob Doten*, '27, were not at home but he did see *Robert Henderson*, '23, in Summit, N.J. *Ted Manglesdorf*, '26, was "off on a fund-raising tour." I regret that he also didn't find *Masons Island* which sounds rather remote but is actually joined to *Mystic* by a 100-yard causeway.

We are sorry to hear from *Nelson Clark* that he has been slowed down by a bad heart valve, but feels much better after dropping his weight from 243 to 147 lbs. . . . *Mark Robbins'* great interest is following auto racing in New England and Canada, but he says that the great

increase in autos on the highways is interfering with his travelling around!

After some years, we are glad to have an up-to-date word from *Robert Hessel* who is a department superintendent with U.S. Steel in Worcester. . . . On retirement to Yarmouthport, *Harland Sisk* took on the job of treasurer for the Cape Cod Standard-Times Neediest Families Fund. In addition, he is now business manager of the *Dennis & Yarmouth* school departments.

Has his day

C. Wesley Meytrott was importantly honored by a testimonial dinner tendered by the Borough of Brooklyn, City of New York. *Abe Stark*, president of the Borough, proclaimed the occasion *C. Wesley Meytrott Day* and urged all citizens "to participate in paying homage to this great humanitarian." The Proclamation pointed out that *Wes* "has served with distinction for every charitable and philanthropic drive in the Borough, is president of the Methodist Hospital of Brooklyn and *Carson C. Peck Hospital*, a member of the Council of the Downstate Medical Center of the University of the State of New York, and a trustee of the University Hospital of Brooklyn, and is also actively associated with the Brooklyn Division, Protestant Council, City of New York, Advisory Council of the Brooklyn Sunday School Union, and on the National Council of the National Conference of Christians and Jews." *Wes*, our congratulations on this record. In about a year *Wes* says that he will retire as Vice President of Consolidated Edison and plans to maintain a reasonably active schedule of voluntary hospital work.

Charles Carr continues to devote himself to the Christian Science healing ministry and lectures from one coast to the other of the U.S. and Canada. Judging by the clippings we received, he has a most busy schedule. . . . New responsibilities have come to *Professor Allan T. Gifford* who has been named Chairman of the Division of Physics and Engineering at Lowell Technological Institute. *Professor Gifford* also retains the position of head of the Department of Civil Engineering which he assumed two years ago. . . . *Ed Damon* describes the *Magellan Straits* as "beautiful with hundreds of

islands some snow-capped on both sides of the ship." *Ed* made a tour of South America on the *M. V. Risanger* of the Interocean Line. . . . *John T. McGillicuddy, Jr.*, has retired as president and general manager of the National Casket Company. He will become Chairman of the Board and serve in a consulting capacity. . . . When the time comes to write the May notes, I hope that I will be cruising the Caribbean; so don't be surprised if they are missing.—*Joseph S. Harris*, Secretary, Box 654, *Masons Island, Mystic, Conn.* 06355

28

An excerpt from a letter from *Gus Stachelhaus* to *Jim Donovan* dated November 8: "Congratulations on your Presidency of the Class and Success and Good Luck! Your comments about the transition period towards "active retirement" bring chuckles because this thought applies to many areas of our lives, business and otherwise. As you can surmise, I shall be retiring from General Telephone and Electronics—Sylvania Electric Products in approximately two and a half years and am looking forward to it with mixed emotions as I suppose most of us do. I am in my 36th year with Sylvania and 10th at the California location, staff assistant in Physical Design and Support after having been the manager for three years.

"To refresh my memory on your company and to obtain the correct address I just ran through the microfilm file on Artisan Industries that we have in our Components Engineering Department on VSMF (Visual Search Microfilm File) equipment. Very interesting! And congratulations on your building up such an excellent operation! As you also probably know, our Sylvania Electronic Systems Group Headquarters are in Waltham on Sylvan Road and from my vague memory of the Waltham area, close enough so that I should look you up the next time I am at Headquarters."

Florence Jope submits an interesting summary of notes taken from Christmas cards she received last December. There were holiday greetings and some enthusiastic comments about the 40th reunion

from: Clara and Arch Archibald, Iris (Mrs. *Ermanno*) Basilio, Marjorie and Bill Bendz, Ruth and George Bernat, Ethel (Mrs. Carl) Bernhardt, Dorothy and Fitch Briggs, Ruth and Chris Case, Jan and Jack Chamberlain, George and Marie Chatfield, Martha and Don Fraser, Huyler Ellison, Sally and Bill Hall, Helen and Bob Harris, Adrienne and Art Josephs, Janet and Fred Lewis, King and Paul Martini, Bill McClintic—whose greetings popped out on a golf ball on a spring!, Bea and Johnny Melcher, Frances and Carl Myers, Gladys and David Olken, Edythe and Dick Rubin, Kay and Walter Smith, Dorothy and Herm Swartz, Ann and Will Tibbetts, Lillian and Gilbert Unverzagt, Velma and Charles Worthen—whose card was an original art creation of Velma's.

From Slim and Alice Maesar came word of Slim's "still enjoying his work." . . . Peggy Mangurian commented, "George and I are going to Europe—leaving April 24—and I shall take my red umbrella. See you in 1973!" . . . With her usual vivacity Anne Palo wrote, "We went to Russia for the World Energy Conference and then toured Russia looking at heavy industries. Fascinating but strenuous! England for two weeks after was a joy! We could talk. The restraint in Russia is unbelievable." . . . Betty and Dudley Smith regretted not being at reunion although their 26-day trip to the Caribbean was delightful.

The message from Verna and Rudy Slayter was, "We joined the fraternity of doting grandparents on June 21, when Elspeth Maclean Slayter came to Lincoln. When her mom and dad leave her here for a bit, they have to get a writ of habeas corpus to regain possession. Her 'Gramp' is having a stone cottage built for her first jaunt to Maine." . . . From Maine came Louise and Ernie Knight's card showing the picture of a proud pair of grandparents and grandson Eric against the colorful background of the beautiful lake on which their home is located.

Virginia (Mrs. George) Rigby called it a "Moving-about year" for her during which she had made the circuit from Hawaii to New England and back again with many stops in between including the M.I.T. Reunion of "this outstanding class and their families." . . . At the retirement reception given at the M.I.T. Faculty Club for Ruth King, who had been an important part of the *Technology Review* staff since the beginning of '28's alumni days, Frances and Jim Donovan, Lillian and Gilbert Unverzagt and Florence Joep were among the numerous guests. . . . On the back of the Alumni Fund envelope returned by Lew Coonley, he notes that he retired as of July 1, 1968. We congratulate Lew.

And from the *Evening Times* of Trenton, N.J., we read that Ed Stevens is chairman of the board of Pelletronics Inc., 210 East Hanover St., Trenton, N.J. This new corporation will manufacture a non-metallic pellet for uniform high speed blast cleaning and finishing. Ed Stevens was former

president of Baldwin-Ehret-Hill Inc., of Trenton. The spherical pellets which the new company will produce will range in size from 1/8 inch in diameter to some so small they cannot be seen by the naked eye.

And a report from Chris Case to your secretary follows: "Ruth and I spent five days in Washington attending the inauguration of President Nixon. We stayed with John Robinson and wife Bunny in Silver Spring, just outside Washington in Maryland. We were busy from nine in the morning until two to three a.m. each day. We attended all sorts of theatre parties, receptions and cocktail parties.

"We had a short visit on Sunday afternoon with Jim Allan and his wife Virginia. Jim retired several years ago because of his health. If any of you are in Washington, I know he would be pleased to see you. We had hoped to see Ben Kelsey and his wife Caryl but couldn't fit it into our schedule. We did talk to them on the telephone.

"Last night we attended a joint meeting of the M.I.T. Club of Hartford and The Wellesley Club of Hartford at The Wampanoag Country Club in West Hartford. Two students from M.I.T. and two students from Wellesley spoke about their experiences under the M.I.T.-Wellesley Cooperative Program. The Key Tones from M.I.T. were also there. It was a very interesting evening.

"My sister Betty and her husband Dud Smith leave shortly for a three weeks trip to South America. In June Ruth and I attend my 45th reunion at Phillips Andover. We sure enjoyed seeing everyone at the 40th reunion last June. It is too bad that we can't get together more often."—Hermon S. Swartz, Construction Publishing Co., Inc., 72 Muzzey St., Lexington, Mass. 02173

29

Betty and Dan McDaniel sent us a "wish you were here" greeting in January from what they describe as "America's most primitively beautiful island"—St. John in the Virgin Islands. Their message sounds most venturesome. "One can explore the many trails up and down the mountains without use of a machete, at least not very often. We've enjoyed the perfect beaches and the superb accommodations right next to this wilderness where the roads were really meant for mules, not even jeeps which they use. Only one gas station on the island! One of the guests here are the Hugh Fergusons of Dewey & Almy and M.I.T." Thanks for this nice addition to our travelog.

A.S.M.E. honor

Hunter Rouse made the news again when the highest honor of the American Society of Mechanical Engineering was bestowed upon him December 4, 1968, in the form of honorary membership to the Society. This was in recognition "of

his significant and lasting contributions to engineering education throughout the world; and of the tireless effort, leadership and vigor which he devoted to the service of his profession." Congratulations, Hunter.

Brief notes

We have accumulated several notes from our fellow classmates who are now on the retired list and the following is a run-down of their present activities. William Carter of Cincinnati, Ohio, writes that he is now retired from his position as Director of Quality Control at Formica Corporation, a subsidiary of American Cyanamid. . . . Newell Mitchell is retired but adds that he is active with the Litchfield Hills Audubon Society which he served as president for two years; and with the Connecticut Chapter of the Appalachian Mountain Club and their numerous hiking and camping outings.

John Clingan, residing in New York, writes that he retired in 1966 and is now enjoying summers in the country, traveling, sports, the theater, etc. . . . From Franklin, Mich., we heard from Thomas Dadson who retired from American Motors Corporation, Kelvinator Division, July 3, 1968, after twenty-two years in electric range engineering. He was chief range engineer for 10 years and is setting out as a designer-consultant in this field.

Bill Saunders of Laconia, N.H., writes: "After 35 years in a manufacturing business (tube bending) I sold it and retired. My course in building construction helped me only in my first few years out of Tech. Now plan to spend seven months in New England and five months in Florida. My hobbies of sailing, fishing and golf keep me very busy." . . . Al Hayes, of Whiting, Ind., brought us up to date on his activities with a note on his retirement October 1, 1968, from the American Oil Company after more than 38 years with the company. For the past five years he has been manager of Technical Service in the Manufacturing Department of the American Oil Company which operates twelve refineries in the United States. . . . An earlier note from Wes Walters reveals that he retired from the U.S. Army Corps. of Engineers in 1965, after 36 years of service. Since then he has been spending winters in warmer areas such as Arizona during part of the winter season. Wes's home is in St. Paul and he does some work for the State of Minnesota in the water resources field and is trying to promote good water resource planning and management at the state level. Wes reports that on a trip to Eastern Canada and New England in the fall of 1967 they enjoyed seeing the Larry Newmans, the Winfield Bearces and Professor J. B. Babcock in Maine.

And then we have a note from Daniel J. Collins who is embarking on a new venture in the form of a new company, concentrating on industrial control systems. The name of the company is Computer Identities Corp., in Westwood, Mass.

FIFTH ANNUAL TOUR PROGRAM—1969

This unique program of tours is offered to alumni of Harvard, Yale, Princeton and M.I.T. and their families. The tours are based on special reduced air fares which offer savings of hundreds of dollars on air travel. The tour to India, for example, is based on a special fare, available only to groups and only in conjunction with a tour, which is almost \$400 less than the regular air fare. Special rates have also been obtained from hotels and sightseeing companies. Air travel is on regularly scheduled jet flights of major airlines.

The tour program covers four areas where those who might otherwise prefer to travel independently will find it advantageous to travel with a group. The itineraries have been carefully constructed to combine the freedom of individual travel with the convenience and saving of group travel. There is an avoidance of regimentation and an emphasis on leisure time, while a comprehensive program of sightseeing ensures a visit to all major points of interest. Hotel reservations are made as much as a year and a half in advance to ensure the finest in accommodations.

THE ORIENT

30 DAYS \$1569

Mar. 22, Jun. 28, Jul. 26, Sept. 20

1969 will make the fifth consecutive year of operation for this fine tour, which offers the true highlights of the Orient at a sensible and realistic pace. Eleven days will be spent in JAPAN, divided between TOKYO, the ancient "classical" city of KYOTO, and the FUJI-HAKONE NATIONAL PARK, with excursions to NARA and NIKKO. Five days will be spent in HONG KONG and four in the fascinating city of BANGKOK. Shorter visits to SINGAPORE and the lovely island of FORMOSA complete the itinerary. Optional pre and post tour stops may be made in HONOLULU and the WEST COAST at no additional air fare.

A complete program of sightseeing will include all major points of scenic, cultural and historic interest. Features range from a tour of the canals and floating markets of Bangkok, an authentic Javanese "Rijst-tafel" in Singapore, and a launch tour of Hong Kong harbor at sunset, to a "Mongolian Barbecue" in Taipei, and a trip on the ultra-modern 125 m.p.h. express trains of Japan.

Tour dates have been chosen to coincide with outstanding seasonal attractions in Japan, such as the spring cherry blossoms, and beautiful autumn leaves, and some of the greatest annual festivals in the Far East. Total cost is \$1569 from California, \$1739 from Chicago, \$1807 from New York. Special rates from other cities.

INDIA

Including NEPAL and PERSIA

29 DAYS \$1636

Mar. 15, Mar. 22, Aug. 2, Oct. 4

An unusual opportunity to see the diverse and fascinating subcontinent of



India, together with the once-forbidden kingdom of Nepal and the rarely-seen splendors of ancient Persia. Here is India from the mighty Himalayas to the palm-fringed Bay of Bengal: the great seaport of BOMBAY; the magnificent cave temples of AJANTA and ELLORA, whose thousand year old frescoes are among the outstanding achievements of Indian art; MADRAS, in the south; the great industrial city of CALCUTTA; a thrilling flight into the Himalayas to KATHMANDU, capital of NEPAL, where ancient palaces and temples abound in a land still relatively untouched by modern civilization; the holy city of BENARES on the sacred River Ganges; AGRA, with not only the Taj Mahal, but many other celebrated monuments of the Moghul period such as the Agra Fort and the fabulous deserted city of Fatehpur Sikri; the walled "pink city" of JAIPUR with an elephant ride at nearby Amber Fort; the unique "lake city" of UDAIPUR, with its delicate white marble palaces; the great capital of NEW DELHI; and the fabled beauty of the VALE OF KASHMIR, surrounded by the snow-clad Himalayas. PERSIA (Iran) includes visits to PERSEPOLIS, the great royal capital of Darius and Xerxes in the 5th century B.C.; and ISHFAHAN, the fabled city of the 15th-17th century Persian Renaissance, with its palaces, gardens, bazaar, and famous tiled mosques. Outstanding accommodations include hotels that once were palaces of Maharajas and luxurious houseboats on Dal Lake in Kashmir. Total cost is \$1636 from New York.

SOUTH AMERICA

31 DAYS \$1599

Jan. 18, Jul. 26, Oct. 18

An original itinerary which takes unusually full advantage of South America's great scenic and cultural attractions. The trip descends along the West Coast, dominated by the towering Andes and filled with the churches and mansions of 16th and 17th century Spain, and returns through the modern cities and lush scenery of the East Coast. Stops include Spanish colonial QUITO, with the nearby Indian market at AMBATO and a drive along the snow-capped peaks of "VOLCANO ALLEY"; Pizarro's great viceregal capital of LIMA; the ancient city of CUZCO and the fabulous "lost city" of MACHU PICCHU; lovely SANTIAGO in Chile; cosmopolitan BUENOS AIRES, the continent's largest city; BARILOCHE, in the beautiful ARGENTINE LAKE DISTRICT; spectacular IGUAZU FALLS (largest in the world); the sun-drenched beaches of RIO DE JANEIRO (considered by many the most beautiful city in

the world); the quaint and historic town of OURO PRETO (so revered by Brazilians that the entire town is preserved by law as a national museum); the striking contemporary architecture of BRASILIA; and PANAMA CITY with the Panama Canal, Spanish ruins, and free-port shopping. These great points of interest are complemented by an assemblage of South America's truly outstanding hotels. Total cost is \$1599 from New York. Special rates from other cities.

EAST AFRICA

22 DAYS \$1549

Jul. 14, Jul. 28, Sept. 22

A luxury "safari" to the great national parks and game reserves of Uganda, Kenya and Tanzania. These offer a unique combination of magnificent wildlife and breathtaking natural scenery: great herds of elephant in QUEEN ELIZABETH PARK, in the shadow of the fabled "Mountains of the Moon"; a launch trip on the White Nile through hippo and crocodile to the base of the thundering MURCHISON FALLS; multitudes of lion and other plains game in the famous SERENGETI PLAINS and the MASAI-MARA RESERVE; the spectacular concentration of animal life in the NGORONGORO CRATER; tree-climbing lions around the shores of LAKE MANYARA; and the AMBOSELI RESERVE, where all types of big game can be photographed against the towering backdrop of snow-clad Mt. Kilimanjaro. Air travel is used where possible, enabling longer stays within the parks. Also seen are the fascinating capital cities of KAMPALA, NAIROBI and DAR ES SALAAM, the exotic "spice island" of ZANZIBAR, and the historic MOMBASA, a beach resort on the Indian Ocean, with its colorful Arab quarter and great 16th century Portuguese fort. Tour dates have been chosen for dry seasons, when game viewing is at its best. The altitude of most areas provides an unusually stimulating climate, with bright days and crisp evenings (frequently around a campfire). Accommodations range from luxury hotels in modern cities to surprisingly comfortable lodges in the national parks (some equipped even with swimming pools). Total cost from New York is \$1549.

Rates include Jet Air, Deluxe Hotels, Meals, Sightseeing, Transfers, Tips and Taxes. Individual brochures are available on each tour.

For Full ALUMNI FLIGHTS ABROAD

Details 145 East 49th Street

Contact: New York, N.Y. 10017

Marshall David of Wellesley Hills, Mass., is with the Boston Gas Company as Director of Area Development. His name appears in several chapters of a book published in 1968 by the U.S. Army Historical Department on the Ordnance Operation in the Mediterranean Theatre during World War II. He is a Director of the Society of American Military Engineers and Northeast Industrial Development Association.

This issue will bring us into the spring season when thoughts turn to plans for summer fun and relaxation. Doesn't a weekend at Cape Cod sound inviting? Class reunion is just around the corner—June 13, 14, and 15 at the Wianno Club. We'll be looking for you. Best regards.—*John P. Rich*, Secretary, P.O. Box 503, Nashua, N.H. 03060

30

This month our retirement rate, or at least the receipt of news concerning retirements, has taken a jump. The retirees include *Irvine (Ted) Ross*, *Myron Smith*, *Mark Culbreath* and *Stanley Russell*. Ted retired January 1, 1969 after 20 years as Engineering Manager (small motors) with G.E. in Fort Wayne, Ind. He reports that: "Though I am not going in to work anymore, there is still plenty of reason to spend most of our time in Fort Wayne. We would enjoy being surprised by school—and classmates at any time of day or night. Fort Wayne may not be as 'somewhere' as Lake Louise or the Rockies or California, but it is on the way to practically everywhere. It even has charms of its own—Mad Anthony cut a wide swath."

The Ross' older son, David, is Supervisor of the Art Department of Vitro in Silver Spring, Md., and younger son Philip is on a management training program at G.E. Kathy, whom those of you that attended the 30th reunion will remember, works for Lynco Distributors in Fort Wayne and is engaged to a Purdue man with a June wedding in prospect. Ted is Treasurer and a Trustee of the Memorial Baptist Church and has been Choir Director for 20 years. He is a member of the Voluntary Advisory Corps which he describes as "a one-to-one encounter with 'Hard Core' unemployed. Object, to develop job-holding, tax-paying, products—buying, useful citizens where none were before. Industry supported totally." He has been an Honorary Secretary of M.I.T. for 20 years is an I.E.E.E. Fellow.

Ted reports having seen in recent years *Hermon Scott*; *Myron Smith*, who retired from General Radio Co. as of January 1, 1969; *Irving Dow*, who retired from the Department of the Navy in 1962 (reported in the June, 1964 Notes); and *Charley Flint*, who is still working for Bell Labs. The news of *Myron Smith's* retirement came via Ted's report.

As in the last few years, the M.I.T. get-together at the T.A.P.P.I. meeting in New York this year was a breakfast meeting

held at an hour that makes it difficult for commuters to attend. I couldn't manage to get up that early. However, *Howie Gardner* telephoned me and we met for lunch. The principal news of the Gardner family is that both the Gardner daughters, Ellie and Carol, were married within about a month of one another this winter. Teddy has maintained her interest in classical dancing and Howie is busy with his teaching and consulting work.

Daughter is Presidential Scholar

I also learned from Howie that *Tony Savina's* daughter Mary, now a freshman at Carleton College in Northfield, Minn., had last spring been named one of the two Presidential Scholars for the State of Connecticut in 1968. I checked with Tony and he was kind enough to supply the following details: "On May 27 our older daughter Mary received a telegram from President Johnson reading: 'It is a great pleasure to inform you that today I am naming you as a Presidential Scholar of 1968. Mrs. Johnson joins me in extending warm congratulations and an invitation to meet with us at the White House in the near future. Complete details are being mailed to you.—Lyndon B. Johnson.' Mary took off for Washington on Sunday, June 9 and spent 2 memorable days with the other 120 Presidential Scholars chosen from the nation's secondary school graduates. Mom and Dad were permitted to attend the formal ceremony in the White House at which the President addressed the group and presented each of the scholars with a bronze medallion. The parents were then received by the President and Mrs. Johnson, and invited to join them for refreshments in the State Dining Room. This was indeed a most impressive, once-in-a-lifetime experience we always shall cherish." The Savina's younger daughter Jean is a sophomore in high school where she plays the cello in both the high school orchestra and a community orchestra. "Julia (Mom) has returned to teaching. She teaches math at Dolan Junior High School in Stamford, the school she helped get underway when it first opened just about 20 years ago."

Arthur Roberts is associate professor and head of the Department of Tool and Manufacture Technology at Norwalk State Technical College. In September 1968, McGraw-Hill published his textbook, *Numerical Control Programming for Machine Tools*. Arthur says his youngest son recently received early acceptance to M.I.T. and appears to be a budding physicist.

As I have frequently indicated, the Class Secretaries have a continuing problem—developing new sources of information for the notes. The information concerning the Savina family given above was largely derived from a Christmas message that Tony and Julia apparently send to their friends each year. It occurs to me that there may be quite a few of you who follow this practice. If so, I should greatly appreciate your putting me on your mailing list.—*Gordon K. Lister*, Secretary, 530 Fifth Avenue, New York, N.Y. 10036

32

John C. Lyon has been with the Budd Company, Railway Division, for over 35 years and is presently program manager for contract administration. John lives in Meadowbrook, Pa., and he and his family spend summer vacations in Nassau and at Wilmington, N.C. You may remember him from the rifle team at M.I.T.

Richard A. Lobban lives in Devon, Pa., and handles the Mid-Atlantic Region for the Picker X-Ray Company, Industrial Division, serving its clients in the medical, industrial and Armed Force fields.

Miss *Anna J. Haines* is now retired at the age of 82 after serving as Secretary of Health Councils in Boston and Louisville, Ky. She is living in Philadelphia and retains an active interest in the Visiting Nurses Society in Trenton, N.J. She was the young looking 40 year old who took Course VII with our class.

Herman C. Phillips of Wilmington, Delaware, is Director of Technical Services for the International Department of Hercules Explosives which involves extensive travelling to foreign countries. Herman was a graduate student with our class in 1931-1932. . . . *T. Scott Offutt, Jr.*, of Towson, Md., retired from Martin-Marietta in 1961. He has remained a bachelor and actively pursues his hobbies of landscape painting and golf. Scott was one of the early recipients of dual registration at M.I.T. and Harvard, taking his degree in 1932 from Harvard.

Col. *Arthur La Capria* of Laurel, Md., retired from the Army (guided missiles) in 1960. His one big hobby is hunting North American big game. He has bagged a jaguar in a cave in Honduras and other trophies include moose, caribou, Dahl sheep, mountain goat and a Yukon grizzly. Art has a son in Phoenix, Ariz., with the Olivetti Typewriter Company and three grandsons and three granddaughters. . . . *Montgomery Ferar* informs us that his firm of Sundberg and Ferar is designer of aesthetics for the San Francisco Rapid Transit System, the Long Island Railroad, the Washington Metro Transit System and is currently working on the Aerotrain from General Electric as well as interiors of the 1011 Jumbo Jet Airliner for Lockheed.

Ira J. Bach, 748 Buena Avenue, Chicago, Ill., has become president of a new private development firm, Urban Associates, which among other major projects is co-developer of the Edgewater Beach Hotel property. Ira has been a government expert in planning and housing for over 20 years serving as executive director of Cook County housing authority after World War II, executive director of the former Chicago Land Clearance Commission in 1948, planning commissioner for the city of Chicago from 1957 to 1965 and since 1965 executive director of the Chicago Dwellings Association, a city agency.

Cecil Boling has been named chairman of the Board of Dunham-Bush, Inc. Cecil has long been active in the refrigeration and airconditioning industry and after a period directing the activities of his own sales and engineering organization became president of Dunham-Bush in 1951. He was recently elected president of the Airconditioning and Refrigeration Institute.

The first of a series of regional meetings of the 40th Reunion Committee of the Class of 1932 was held with Committee Members from the Boston area on January 15, 1969, at the M.I.T. Faculty Club. Plans for the 40th Reunion and the 40th Reunion Gift Campaign which will cover the five year period 1967-1972 were launched by Chairman *Robert B. Semple*, Class President *Harry L. Moore*, Class Agent *Thomas E. Sears, Jr.*, and Kenneth S. Brock, Director of the Fund for the Alumni Fund Board. The entire Class is being kept informed by letters from the Class President, the Class Agent, and the Chairman of the 40th Reunion Committee of the goals and the expectations we have for making this a great reunion and a grand gift. In these columns we will pass on, from time to time, the progress being made and the committee's needs for your advice and assistance.—*Elwood W. Schafer*, Secretary, Room 13-2145, M.I.T., Cambridge, Mass. 02139; *James Harper*, Assistant Secretary, 2700 South Grant Street, Arlington, Va.

33

We are off and running again in the sixth race of our regular nine race card (issues), and, as an innovation, we prefer this time to start with the press clips, but, before starting, we would like to mention that we had the extreme pleasure of meeting Brenda Kelley, Alumni News Editor, for the first time, at the most recent Alumni Advisory Council dinner at the Faculty Club. If more of you faithful could talk with her for only a quarter hour, you might appreciate the *Technology Review* far more. That gal is an inspiration, and a joy to know. Well, sir, it seems that the American Psychological Association will hold (last August), in San Francisco, a five day seminar on urban revolts, student protests, new leftist policies, and the 1968 elections. The first three might well be current right now, though the fourth might well be deserving of a rearrangement. This affair was most ambitious as 10,000 were supposed to attend, and, at five, *no six*, San Francisco hotels; all the big ones, with names furnished on request. We can't possibly go into the text of the report, as we have no space for it, and, no one would read it anyway.

Just the facts

However, when a 1933 man, *Robert B. Mills*, an old Course IV chap, takes a part, then we perk up and listen, Bob was part of the panel on "Innovations in Police Techniques." Now, no one can ever say that our M.I.T. men are

not versatile. Here is an Architect billed as an expert on police techniques, in a group panel symposium. No details are available, but as for Bob, Goodridge has him as a past president of the Richmond Virginia M.I.T. Club, and a most active Architect, with a series of hobbies; stamps, music, painting, genealogy, and, not least, dogs. His picture shows him with one of his English Setter pups. Eighteen years out of school, he married his lil ol' Virginia (apparently as a permanent measure). Bob, you gave Goodridge the minimum, and, so far, you have given me nothing. Much has happened since 1958, and surely I am entitled to a story. Perhaps I should threaten as I did *Gabby Garbarino*, when I told him if he did not give me the facts on the Garbs, I would invent them! I got the facts. I must drop Bob a line, as I am sure that he is not listening.

Desert research

Now comes a dissertation from the "Desert Research Institute," labelled News and Comment. This, it appears, is the Research Section of the University of Nevada and still a very young effort, I think about eight years, but, it is an operating success, not amazing when one considers that they have one good M.I.T. man on their twelve-man board. This DRI has successfully instituted their original plan of four separate research efforts; atmospheric physics, desert biology, water resources, and anthropology. *Herbert Grier* who lives right there in Reno is our man on that job. Again from Goodridge, Herb is one of our own bachelors in electrical engineering, and a member of the firm of EG & G (in 1958, he was Vice President). Inasmuch as the article on desert research is factual, but too voluminous, Herb, we must again ask if you won't fill us in on some of the more intimate details. You live too far away for me to make a visit, so it appears that, unless you write me, I will just have to drop you a line of reminder.

20 years of service to M.I.T.

A copy of a letter from the M.I.T. Educational Council to a Houston Alumnus, tells us that one of our own, *Duke Selig*, has resigned after 20 years on the Houston Educational Council, including five years as General Regional Chairman, and the whole time as Honorary Secretary. Gentlemen, I submit that a man who spends that long a time on that great Council has done quite a job; a better job for the Institute than most of us. I worked at it for a short time, years ago, and was not a signal success. Apparently, Duke has been just that; a real success. Duke is sort of a typical 1933 boy, he just won't write, or say anything to anyone. But he was a great friend of *Bob Kimball* way back when, and Bob always spoke well of him. Further, he was a fraternity brother of *John Wiley* while at school and was John's roommate. John also speaks highly of Duke. Now, I listened when Bob Kimball spoke, and still do

when John Wiley does. Duke appears to be quite a guy—his Educational Council record proves it 100 percent. Duke, the Institute does appreciate men like you and what you do for it, and us. Please allow me to thank you for a job well done.

Again, *Ellis Littmann* makes the news, this time being chosen again by the Institute to represent it at the Charter Day Convocation, Southern Illinois University, on March 9, 1969. Many times before I have mentioned that this sort of thing as a distinct honor which few of us ever receive. It could not happen to a nicer and harder working fellow. Again, Ellis, our best wishes, and further, our congratulations.

Elected Director

Just received is a rather voluminous and confusing six-page report from the A.I.M. which turns out to be the Associated Industries of Massachusetts. The reason for the report was to announce the new officers and directors. Apparently the officers serve until their successors are elected while directors are elected for three years. So, our own *Ralph Hayden, Jr.*, is now a Director whose term expires in 1971. Ralph is President of The Foxboro Company, in the town of the same name. Some long time ago, Ralph's company made the news on account of a proposed strike. I was unable to raise Ralph for comment at that time, and have little hopes that I can now, but, we report on classmates, no matter. Someone else might get something out of him. He just does not write to me, and he ignored Goodridge for the 25th, too. I guess that he wishes to be alone. However, I will write him again, as he may have mellowed in his declining years.

A.A.A.S. President a cartoonist

Bill Baur, of Philadelphia, and an old mechanical engineer sufferer friend, wrote at some length earlier and enclosed clips from the *Philadelphia Bulletin* and *Enquirer* on *Athelstan Spilhaus* and his resignation from the Presidency of the Franklin Institute of Philadelphia, an Institution on which we feel incompetent to make remarks. We have given *Athelstan* considerable space here in the past and it is and was well deserved. I do wish that he would dictate a short page for *me* sometime. *Athelstan* went to the Institute (Franklin) in 1967, from the University of Minnesota, where he was Dean of Engineering. He is currently the President of the American Association for the Advancement of Science. Many do not know, or ever did, that *Ath* is quite a cartoonist, as author of a science-oriented comic strip which appears weekly in many major newspapers, "In our age." To his great credit, on becoming President of Franklin, he is quoted as saying, "I am terribly interested in communicating Science to kids," and one of his efforts, earlier, was to produce a book on how to build a weather station from junk titled *Weathercraft*. He is and has

been a very interesting and capable man. I wish to thank Carole Clark, Secretary of the Class of 1921, for sending me still another clip on Athelstan.

That seems to exhaust the material in the printed word, for this time around. For the information we are grateful, but, for those classmates mentioned, no credit is due, outside of the specific accomplishment, or occasion. I need fresh news, and, the only way I know of assembling the fresh news is to urge others to write to me, for the benefit of us all.

Personal notes

I have a fine message, though short, on the return section of one of my Note-O-Grams from the one and only *Dick Morse*. I was indeed anxious to know what had happened to Dick as I had no word in several months, or was it almost a year. Well, to shorten the prologue, I quote, "Glad to see you keep after us all, even those who did not make the 35th. Keep it up." So, in reply to specific questions, Dick has quite a lot to say. Both boys are out of college, Kenneth last June from M.I.T., and Richard S. Jr., from Princeton. Kenneth is now in New York City as President of A.I.E.S.E.C. (I must inquire what that is). I will phone him first week in March. Richard S. Jr., is now attending B.U. Law School, after his stint in Vietnam.

But the grandest news of all is that, finally, the Morses are now grandparents via Dick Jr., whose wife presented the family with Richard S. Morse, III. Golly, how one gets fooled. I had our Dick's girl figured as too young to have any but small children, and here she comes up with a grandson. I still can't believe it. Dick, Sr., is still teaching at the Sloan School in the areas of management, organization, and technical enterprises. Further, he is Chairman of Dresser Industries, Dallas, Texas. So as not to miss any nuances, I quote, "I have been playing with some new steam engine developments, and a few odds and ends in industry and government." As some of you might have noticed, some of this has been covered before in these pages. Many, thanks, Dick, and best to those two fine boys. What a joy they are, and what a joy their children will be, if and when they really get going. And, best to that painfully young, and lovely, Marion. M.I.T. is proud of both of you.

Please note that mention was made of *Bill Baur* sending me a letter. Bill, I have not forgotten that letter, even for a second. He and Clare were in Florida early in January on an exploratory trip on the West Coast. Heck, I wish these guys would tell me about these trips, as I could make life very pleasant indeed for them. But, they had to return early as their son returned unexpectedly from Spain and was released from active duty to continue his studies on February 3. Bill made a few comments on *Ed Goodridge's* passing, and also said that he had taken a pair of G.E. men to Ed's new shop, earlier, to see and discuss,

Ed's new brainchild, "Electrostatic Fluidized Bed Dry Powder Coating Equipment." He says that he had samples and powder with him, and worked with Ed and his two sons most of one day. Not only may G.E. have an application for this sort of equipment, but, "it might, and could be, manufactured by a firm on a license basis with whom I have a connection as a consultant after my retirement." Gee, here is one retiree consultant actually working at it, which is a rarity. "Our school, Class, and country will miss Ed, immensely." Well, Bill, I already do.

I have another Note-O-Gram reply; this one from *Charles Bell*, hereinafter called Charlie, as always. He says (no quote) thanks for the note, and I sure do and did need reminding. No news from the Bells! We have five grandchildren, and son David is in his second year at B.U. Medical School. No news, sezze!!

Whadda Character! I knew he had a grandchild or two, but, Gee, five. That guy is luckier than ever and that is really lucky. As for David, he was wiggling through college the last I heard. "Still running the three family businesses, that you know about." Right, we did write up the Bells and the family businesses, just a year ago. Now, they are building another factory in New Jersey, but no mention what for. You see, folks, Charlie remembers what the family businesses are, but, I don't, Haw! And he adds a pleasant note (January 10), Happy New Year to me and Leona. Thanks another million, my boy. I dunno what the heck I would do without you and a few others. I'd have to invent this stuff, and I could, Y'know!!

Bring them back alive

After attending the Alumni Advisory Council meeting in Cambridge, January 27, I went over to New York City for a day or so, to visit with anyone who would stand still. It turned out to be easy—*Johnny Wiley* for lunch at Cavanagh's, way downtown, and dinner with *Gabby Garbarino* at the Waldorf Bull and Bear. It turns out that John Wiley is a born Bostonese, but was removed to New York City early in life. He then came back for a spell, later, but, was a New York resident while a student at M.I.T. I figured he looked a little like a Boston Irish and said so, but John insisted that he is all Scottish (he called it scotch, but only the stimulant is that). John looks well, indeed, and wears better. He is still a bachelor, and claims that his immediate male forebears were not: so!

After commencement, John was with various airlines in many capacities but was with American until 1950, at which time he joined the Port Authority of New York. Lest I forget, John had not only *Duke Selig* as a roommate, but also *Dick (Richard) Hanley*, presently of La Jolla, Calif. John has run the gauntlet since 1950, and is now top man, Director of Aviation for the Port Authority of New York, and my guess is that it is a very responsible position. Greater love hath no man!!

In order to make it easy for John on a working day, I volunteered to meet him near his work. He suggested Cavanagh's, and, in a heavy rain, I got a cab and told the man where to go (23rd and 8th). The man was not listening (I could not see out) and got dumped at 33 and 7th (Penn Station). So, raining, no cabs, I walked the ten plus one blocks, and made the whole trip, cab, walk and rain in 65 minutes. John made it look too easy by sending me back to the Plaza in a private car with a real nice guy as driver. Folks, it is this kind of experience that makes this job, at times, a real pleasure. John, I enjoyed you, and will again.

Then, at 6:30 p.m. I met *Gabby Garbarino* at the Bull and Bear, Waldorf, and we enjoyed a two and one half hour visit, replete with gossip, and reminiscences. To start with the personal part, Gabby and Mary have eight children, a fact not news to many of us. I remarked that there seemed to be no change since the 30th, which appears to be true. Gab was reluctant to be generous with the story of this nice family, and I had to threaten to write it up without his set of facts. So he gave in and, though I do not quote, I do paraphrase his written story (written because I had the guy worried).

He made no mention of ages, so we proceed with the eldest, his only daughter. She is married, teaching school in New York City, and is hard at work seeking her doctorate in literature; no mention of any children. It looks as though the eldest boy of seven did not go to college, and is "on his own," which seems to mean that he is working at a job, right out of school. The second son is a graduate of Yale Law School, and is now at Fort Gordon teaching law. It is not clear from Gab's notes if his commission (Captain) entitles him to teach law at the Fort, or is it elsewhere? Third son is recently out of the Marines and is attending law school. (Yale?) The fourth son is serving his stint as a First Lieutenant of Combat Engineers in Vietnam. Boys five and six are at present in college, and the last, seventh, is in high school. Garb, I do hope that I have translated your handwriting so that Mary will approve of the manuscript, but, in any case I save, via the file, all written biographical data. Just incidentally, talking with Gab is almost like talking with Cal Mohr; both know more classmates than can be imagined. Gab even wanted to know if I remembered Bustani from Lebanon (since deceased), and I had to admit that not only did I remember him, but also his bosom buddy, also from Lebanon, though neither of us could remember his name. My cross file, being nonexistent, is of no help. Does anyone remember the other fellow? He was not quite as impressive as a personality as Bustani, but he was a fine and capable chap. Gab wonders why more fellows do not ring him up when in New York. I wonder, too, considering that he is one of our more charming classmates. Many thanks for your time and good fellowship, Gab.

News of Fund contributors

The Alumni Fund Capsule system produces four brief returns from as many of the faithful. *J. Dyer Potter, Jr.*, it seems, is still with the Connecticut Highway Department, but it says here, he will retire in 1970. I have given *J. D.* several chances to unburden himself to me via the mails but he does not seem to have the mood to write, which places him with a vast majority. Now, *J. Dyer*, when you read this immortal sketch, you will have returned from Hawaii, and that wonderful flying trip with your *Petey* (*Edith*, wife!), and you can sit right down and tell me all about it, so that I can make a comparison with my recollection of the same lovely spot. *J. D.* and *Edith* are taking a months vacation in Hawaii, this coming March. Say, son, why not phone up *Frank Der Yuen*, at Aloha Airlines, Honolulu, and have lunch with him. He will make you meet him at the airport dining room, but you will like that as the view of Army air field, the airport, and Pearl Harbor is a really marvelous sight to behold. And, don't deprive the little girl of that experience. Do this first and then take the tourist excursion trip to Pearl Harbor afterward. And, don't avoid going to see the Pineapple Plantations.

Also via Fund Capsule, *Leon Hyzen* writes from California, and this rates a quote, "San Clemente has become a bee-hive of interest in oceanography with a corporate group planning a multi million dollar educational and research facility, which will cover a range from primary to college level graduates. *Leon Hyzen Associates* is preparing a feasibility report." That is all, but, the stuff does stimulate one's interest, and, *Leon*, when you read this won't you fill us in a bit more, as oceanography is a real moving subject these days, and many of us are directly interested. Your plans for the Educational and Research set up appear to be particularly timely.

Now, two notes from Texas, first from one brand new to me, and am I pleased. It is from *W. W. (Ike) Newton*. *Ike* is brief, but concise, when he says that he is now an independent exploration consultant, geophysical, in oil, gas, and other minerals, and, that he is also a grandfather as of two years ago, when he had himself a granddaughter. Well, *Ike*, that gets you into the Club but not as a Charter member, as that classification closed several years ago. Thanks, *Ike*, for your short and sweet bit. It would be easy to expand on it for the benefit of the remainder of your course and classmates.

The other note is from one who has been written up before, when he moved from Texas to New Orleans on a pretext, then, a year or so later, he moved back to Texas, again on a pretext. He just won't write to me, so I get the news second hand, from the "Change of address" system, and via the Alumni Fund capsule. The man in question is *Bob*, (*Robert*) *Dillon*, and I quote him so that he will receive the wrath of whatisis directly. "Back in Texas after a fun filled year in New Orleans. Texas has a lot to learn." How

about that last bit, when one might consider it the understatement of the century? By Golly, that might be the way to draw *Bob* out; ask him to contribute to a sub-column, titled, "What Texas has to learn." OK, *Bob*, we will await your further pleasure, when you either move away or come back.

In Cambridge

By golly, I almost forgot to mention that I did see a few Classmates at the January 27 meeting of the Alumni Council, dinner, etc. It appears that *Bill Barbour* is always there, and a more consistent, interested, harder working classmate might be real hard to find. *Bill* is, if I am correct, the third generation *Barbour* at M.I.T. *LeBurton Webster* was also present, and he, too, is one of the regular attendants at this and many other functions. What with a late start in looking for a table, the perennial *Westy Westaway*, and I, did not sit with the others, as they seemed to have had a sort of previous engagement. I have fallen into the habit of not mentioning *Westy* except when he is not present at one of the M.I.T. meetings, no matter what the occasion is. *Westy* is about the most faithful of all of us, because he does have a bit of free time that some of us do not, as he, too, like *J. Wiley*, is a bachelor, and two, he would find the time anyway, were he not a bachelor. He is an interested participant. Further, we need many more like these three. We lose out not because of lack of candidates; just lack of likely candidates.

Other than classmates, I also saw and spoke with briefly, *Don Severance*, *John Mattill*, who was busy making a photographic record of the events, and one other, that I understood to be the Managing Editor of the *Review* one *Wheeler*. Anyway, I did meet *Wheeler*, no matter what his job is. He allowed me to think that he is or was an Englishman, and, he hides behind a most glorious bushy growth on his front facade. And, withal, he left the impression of being a nice chap and a capable fellow to boot. [*Fred Wheeler* (Englishman) is the new Managing Editor of the *Review*.—Ed.] Gee, I almost forgot *Dick Wright* who introduced me to *Brenda Kelley*. I knew *Dick* had charge of advertising but I had to check to be sure that he was *Wright*, and not someone else. I asked. He was.

Changes of address

For want of a better spot, I wish to include the change of address feature in this spot, even though there may be other and more important items coming. I just can't allow too much material to accumulate, as time runs out. We must be prepared to close up quickly, if need be. So, with the help of the Alumni Records, we have tracked down *Captain T. Gorman Byrne*, U.S. Coast Guard, Retired, and now living in Harrisburg. We tried to find *Captain Gorman* for a visit a few weeks ago in St. Louis but he had disappeared. Aside from *Captain Byrne*, the following have moved and the new addresses are available to any who ask. *Joseph E. Carbonell Jr.*, Architect;

Morris Guralnick, Naval Architect; *Lawrence J. Hubbard*, Management; *John T. Longley*, Electrical Engineering; *Robert G. MacKay*, Management; *Gordon C. Thompson*, Aeronautical Engineering; *LeBurton D. Webster*, Management and last, and surely not least, *Robert H. Winters*, Electrical Engineering. Incidentally, *Bob* is in private industry, but, can I get his home address? No. A 1,000 times no! He will not reply to that letter, and look at all the plugs I put in for that character. Anyway, I still love *Eleanor* and *Bob* a little.

A moot subject

As we near the close of this epistle, it behooves me to bring up a moot subject the 40th Reunion Class Gift to the Institute. The opening guns have already been fired. Chairman *Ellis Littmann* is already at work; they have had one meeting at Cambridge with *Ken Brock* for organizing purposes and the committee plus all class officers will meet in Cambridge, April 28. I have told you folks countless times that I am definitely not a fund raiser. I still am not; but, as *Ye Scribe*, I surely must tell you folks the story as it unfolds. There will be a lot of unfolding over the next four years plus, so *Ye Scribe* will tell you as it happens.

You will not be allowed to forget the campaign for more than 30 consecutive days, except in the summertime, and I am about to work out something for that period. One might gather that I, personally, have more than a normal amount of interest in these campaigns. The answer is that I do. I have an abiding love for M.I.T. and I wish to see that it shows. Apparently it does. Please remember that every dime you give the Institute between July 1, 1968, and the same date five years later goes into this Reunion Fund. I'd like to see three quarters of a million, which, even then will not be a record.

Classmate deceased

We are saddened to find that another of us has passed to his reward—Colonel *John C. Raaen*, Course II, at his retirement home in Largo, Florida. It is regrettable that we sometimes hear about these items far too late for anyone to express himself properly, when we consider that an 8 to 9 months interim makes us hesitate to bring the matter up afresh with the loved ones. I remember *John* as being one of those few who were older than I was at the time. *John* graduated from West Point 12 to 14 years before going to school in Cambridge during the depression. So, and belatedly, our entire class joins me in saying to *Mrs. Raaen* that we feel a real loss, and that we think of her in her sorrow. So ends this chapter of the History of the M.I.T. Class of 1933. Any of you fellows who learn to write are invited to get the story into the record. So long for now, We appear again in May.—*Warren J. Henderson*, Secretary, Fort Rock Farm, Drawer H, Exeter, New Hampshire 03833

E. Philip Kron writes: "Our youngest son John entered Colorado University last September after spending the summer in England at the University of Reading in the Foreign Language League Program of English Drama. One of his classmates there was Bill Brown, son of Win Brown, '34."

Irving R. Kusnitz tells us: "I just returned from two months in Mayagua, Nicaragua, where I was engaged in installing a new plant for manufacturing leather finishes in connection with my work for Stahl Finish Co., Inc., of Peabody, Mass. It was a great experience both professionally and personally. One of the most exciting episodes was a visit to Cerro Negro, the active volcano near Leon, Nicaragua, where I was able to get some excellent photographs."

Jerome M. Raphael joined the faculty of the University of California, Berkeley in 1953, after working on dams for the U.S. Engineers and U.S. Bureau of Reclamation (Shasta, Grand Coulee, Hungry Horse, Bhakra, among others). He was Chairman of the Structural Division of the Civil Engineering Department 1964-1967. Currently, he is a consultant on Arch Dams, such as Mossyrock, Bullards Bar, Oroville. He has three children, a son at Annapolis, another at Sacramento State and a self-supporting daughter.

From *Richard H. Sanders*: "We became grandparents for the first time via daughter Lynn S. Meyer living on Long Island, N.Y.—a grandson Keith P. Meyer, August 12, 1968."

Ed Geitmann reports that with both daughters married, one son a Chemical Engineer with Union Carbide, and the other heading for Medical School, he and Mary have moved into the guest house and will put the big one up for sale. "So much for the population explosion at Oconomowoc, Wisc. Will be looking forward to attending the 35th reunion. (First one!)"

Henry B. Backenstoss announces the formation of Bray, Backenstoss & Co.,

Inc., Ltd., Consulting Engineers in partnership with Oscar S. Bray. The firm has acquired the overseas physical assets and staff of Jackson & Moreland International, Inc. and will continue its foreign activities. The offices abroad are located in Vaduz, Liechtenstein; Beirut, Lebanon; Riyadh and Jiddah, Saudi Arabia; U.S. office, Post Office Box 907, Lynnfield, Massachusetts 01940

Walt Wrigley, Professor at M.I.T.'s Instrumentation Lab, has been elected a fellow of the American Institute of Aeronautics and Astronautics. . . . *Walter Bird* had a book review published in the November 1968 *Architectural Forum*.

Herb Andrews is now working at Colgate-Palmolive Research Center at Piscataway, N.J., as a Senior Research Chemical Engineer. . . . *Bill Schumacher* celebrated his 30th year with U.S. Civil Service on November 1, 1968. His son Bill is married and in the Navy (Nuclear Sub). He has two boys in college and a daughter in high school. He recently celebrated his 28th wedding anniversary.—*Norman B. Krim*, Secretary, 15 Fox Lane, Newton Center, Mass. 02159; *George G. Bull*, Assistant Secretary, Mid-Atlantic, 4961 Allan Road, Washington, D.C. 20016; *James Eder*, Secretary, 1 Lockwood Road, Riverside, Conn. 06878; *W. Olmstead Wright*, Secretary, 1003 Howard Street, Wheaton, Ill. 60187

35

This month's news comes from a wide variety of sources, including notes on Alumni Fund contribution envelopes, press releases, news clippings and letters. *Roger S. Brookman* reports that he sold his company to AMP Precision Industries and is now Vice President of Dustex Division of API. He has five sons, all graduated from college. Two are engineers, graduates of Case Institute, one is in medical school, one is in insurance and one going on to graduate school in history. He has three daughters-in-law and three grandchildren; his wife is now teaching and he keeps busy with school board and church board work.

Clarence D. Davis is Professor of Obstetrics and Gynecology, with major fields of interest in the study of maternal and perinatal morbidity and mortality and intrauterine fetal transfusion for erythroblastosis. . . . *Jefferson Farmer* reports that after 23 years in the good old State of Maine, he has returned to Massachusetts; instead of making paper, he has become involved with the making of the machinery that makes paper. . . . *Prentiss Huddleston* is a partner in Huddleston, Satterfield, Evans and Lillie, architects and engineers; and in Big Head Engineering, Inc. . . . *J. P. Bainbridge* is enjoying living in New Canaan, Conn., after 10 years in Iowa.

From *Richard L. Shaw*: "Still married—we play golf and tennis, ski in season. Three baccalaureate children, two male, one female going for masters degree. One married (this required a trip to San Francisco this past July)." . . . From *Alfred L. Greenlaw*: "In April I was retired from the Baltimore Division of Martin Marietta as it was taking its last few breaths of air. After 25 years, I am starting anew with the Commercial Airplane Division of the Boeing Company.

"I sold my house, ten acres and tennis court, in Baltimore in June and moved my wife and children, David 18, Stanford '72, Mary Ellen 17, James 15 and Billy 12, to Seattle. I hope eventually to take in some of the beautiful scenery in the area and enjoy some skiing."

David D. Terwilliger, whose father was M.I.T. '14, has three M.I.T. sons: P. T., '68, R. D., '71, and Peter G., '72. . . . *Ed Loewenstein* represented M.I.T. at the inauguration of the new president of Bennett College in October; *Carson L. Brooks* represented M.I.T. at a similar inauguration at Randolph-Macon College in September. . . . *Richard H. Cook* has been promoted to Manager of the Order Processing Department of the Foxboro Company; *Oliver Hoag* to the Production Manager for Ben-Mont Paper Converters in Bennington, Vt.; *William J. Suchors* to Vice President of the Sunbeam Corporation in Chicago; and General *Frank S. Besson, Jr.*, is Commander of the Army Materiel Command in Washington, D.C.

Leo Epstein, one of the original General Electric atomic energy pioneers has transferred to the Argonne National Laboratory in Argonne, Ill.—Co-secretaries: *Phoenix N. Dangel*, 329 Park Street, West Roxbury, Mass. 02132; *Irving S. Banquer*, 20 Gordon Road, Waban, Mass. 02168

36

As you know these notes are prepared some six weeks ahead of publication. The Boston papers during the week of February tenth carried two items of interest to members of the Class. In an account of a heart transplant operation on a six year old girl in Cincinnati, our own Dr. *Edward Pratt*, Chief of Staff at Children's Hospital in that city, was quoted extensively in interviews.

Later that same week the papers reported the untimely death of *Michael Lach* after a brief illness. He died in Carney Hospital on February 12, after a brief illness. He lived in Quincy and was manager of Technical Analysis for Eastern Gas and Fuel Association. A veteran of W.W. II, he was a retired lieutenant colonel in the Army Reserves. To his wife, Dorothy, three sons; *Michael, Jr.*, *Thomas* and *Stephen*, and daughter *Martha*, the Class of 1936 extends sincere sympathy.

Gordon and *Mary Louise Thomas* have sent a card indicating a change of address from New York to Boston. *Gordon's* business address at 225 Franklin St., Boston 02107 and the family home on Old Coach Road, Cohasset 02025. By next month I shall hope to have more information on this and other address changes. Mine remains the same.—*Alice H. Kimball*, Secretary, 20 Everett Avenue, Winchester, Mass. 01890

37

Milt Lief is manager of manufacturing at the Alvey Conveyer Manufacturing Co., St. Louis, Mo. His daughter *Anne* is a graduate of the University of Missouri, now working in Boston at the Beth Israel Hospital as a medical technologist.

His son *Laurence* is a junior at Princeton. His daughter *Debra* will graduate this June from high school. *Milt* is also chairman of Land Clearance Authority, chairman of Citizens Advisory Commission and president of Olivette Businessmen's Association.

Harry N. Wallin, Rear Admiral USN, retired on October 31, 1968 from active duty in the Civil Engineer Corps of the U.S. Navy and joined the Bechtel Corporation in San Francisco on December 1, 1968. His last assignment in the Navy was Commander of the Atlantic Division of the Naval Facilities Engineering Command and Fleet Civil Engineer for the Commander-in-chief, U.S. Atlantic Fleet. His new home address is: 300 Davey Glen Rd., Apt. 3823, Belmont, Calif. . . . *Matt Rockwell*, executive director of the Northeastern Illinois Planning Commission, writes that he is "glad to report that *Joe Smedile* (Colonel, Corps of Engineers, retired) has joined my agency as Resources Officer and as such has charge of preparing a six county plan of Sewer and Water Facilities for the Chicago Metropolitan Area."

Ed Tibbetts is vice president of Wollaston Alloys, Inc., of Braintree, Mass. . . . *Harry Stern* has recently been appointed president of the newly named Burlington Worsted (formerly Pacific Mills) division of Burlington Industries, Inc. *Harry* joined the Pacific Mills division in August 1964, and was subsequently named vice president in 1966, and executive vice president, marketing, in June 1967. Before joining Burlington, he was a group vice president, operations, for Indian Head, Inc. . . . *Willard Marcy* is with the Research Corporation, New York, N.Y., and has recently written an article entitled "Discovery to Patent to License" which has been published in *Science Magazine*, December 1968. . . . *Virginus Vaughan* has been elevated to the grade of Fellow by the I.E.E.E. Board of Directors for pioneering work and subsequent leadership in data communications engineering including systems planning, project management, and standards activities.

Dave Fulton is vice president of business development for Chemico.

Bill Bergen, President of the Space Division of North American Rockwell, Inc., California, was recently the guest speaker at the Boston Museum of Science's dinner inaugurating a three-day series on the museum space program and the mid-October lunar mission.—*Robert H. Thorson*, Secretary, 506 Riverside Ave., Medford, Mass. 02155; Professor *Curtiss Powell*, Assistant Secretary, Room 5-325, M.I.T., Cambridge, Mass. 02142; *Jerome Salny*, Assistant Secretary, Egbert Hill, Morristown, N.J.

38

Your Secretary is working under a real handicap this month—for all of my complaining I wind up with only two items, one of which I had already reported the previous month. The other involves *Al Wilson*, who has gotten so much publicity from me that I am drawing the line here and now.

This simply means that there is an aching void, because YOU have not written in. These are the April notes, which are due February 17. The May notes will be due on or about March 15. At that moment of time *Don Severance* and I, together with our respective brides, expect to be in Mexico City at the 21st Mexican Fiesta, which means that the May notes will be written by the Secretary to the Class Secretary, who is my secretary—*Pat Jordan*. This is my sneaky way of telling *Pat* what she has to do, and at the same time, absolving myself of any responsibility.—*A. L. Bruneau, Jr.*, Secretary, Hurdman and Cranstoun, 550 Broad St., Newark, N.J. 07102

39

I. B. (Budd) Venable, Course X, sent a welcome Dow notice announcing his assignment as Executive Vice President of Petroquímica Dow, S. A. and President of Dow Chemical Chilena, S. A. The two companies will be manufacturing a complete line of thermo-plastics, polyethylene, polystyrene, and PVC, plus a line of mining flotation agents. *Budd* hopes he can arrange a business



G. E. Power, '41



J. E. Yocom, '44

trip back to the U.S. to coincide with our 30th reunion and a good old-fashioned clambake. That plug by Budd for the thirtieth is an excellent way to open this column; the Committee hopes that many of you have set aside time and funds for attending this milestone.

The '39er with the most headlines these days is the new Massachusetts Governor, *Francis W. Sargent*, who succeeded John Volpe who was selected for the Nixon Cabinet. Since Frank has made the news so much recently, let's save further details with the hope that he can be persuaded to spend a few hours at least with those who plan to gather for the thirtieth reunion in June.

Sikorsky Aircraft President

You read here earlier of *Wesley A. Kuhrt's* elevation to the presidency of Sikorsky Aircraft. Thanks to Philip B. Walker, Class Secretary of '07, I had the pleasure of reading a full page feature story on Wes which appeared in the *Bridgeport Sunday Post*, January 5. Several fine photos were included of Wes in the plant, with Igor Sikorsky, and with his family. To date, Wes has had an admirable and enviable career! And thank you, Phil, for the extra news.

From around the world

Chua Hoonchamlong, Course II, wrote that he is now Deputy Chief Mechanical Engineer for the State Railway of Thailand. He is located in the Mechanical Department, Makkasan Workshop, in Bangkok.

Nicolaas Ferreira, also Course II, is Town Engineer of Sasolburg, South Africa. Nick wrote: "My best wishes to all my classmates and my dear professors. May 1969 prove kind to all of us." *Thomas M. Leps*, Course I, said that he was recently appointed Chairman of the Board of Consultants for design and construction of Sirikit Dam on the Nan River in Thailand, a 360-foot high earth dam which will make a major contribution to irrigation and power in Thailand. He is continuing with consulting assignments for the California Aqueduct, San Francisco's Bay Area Rapid Transit System, various dams, and difficult foundation problems.

Another Course I star is *Frederick G. Lehman*, who noted that he was appointed Distinguished Professor of Civil Engineering last year, and since September he has served as Chairman of the department. He has initiated programs to educate minority groups in municipal engineering and in contract management. . . . *Theodore P. Snow*, Course XV, wrote that he is completing his 30th year with Boeing and his 8th year in Huntsville as area marketing manager (or representative) for Boeing.

B. Allen Monderer, Course VI, said that he has opened a new business two years ago in Colorado Springs, "in the shadow of beautiful Pikes Peak, and the home of North American Air Defense Command in Cheyenne Mountain." Al didn't say what his business is, but quite obviously he has close ties with his Chamber of Commerce as a Colorado booster!

George D. Cremer, Course IX-B, wrote from San Diego about being the new grandfather of twins, born to George's daughter Jo Ann, Mrs. Russell Richard. Another daughter, Darcy, is in her second year at Hastings Law School, San Francisco. His third daughter, Valerie, will graduate in archeology from Berkeley next fall. . . . From the *Wall Street Journal*, *Benjamin W. Badenoch*, Course XVI, has been elected vice president, Sperry Rand Corporation, New York. And the final item of this month, *Edmund S. Rittner*, Course V, was elected Fellow of the I.E.E.E. for his contributions to photoconductors and semiconductors.—*Oswald Stewart*, Secretary, 3395 Green Meadow Circle, Bethlehem, Pa. 18017

40

Among our many sailors is *Charles Stokes*, Course X Sc.D., who notes, "Highly successful cruise on our yacht Pifata (Morgan 34) Toms River, N.J., to Nantucket and return. Three weeks under sail and almost lost her in violent line squall off Jersey coast. Professor and Mrs. Melssner, Course X, on cruise to Block Island with us." . . . *Garrett Sloan*, Course XI S.M., writes, "In 1966, I was appointed as Director, Department of Water and Sewers, City of Miami. Our agency supplies water to the entire metropolitan Miami area. We are in the midst of an apartment house building boom." . . . The last of the direct communications is from *Ed Di Giannantonio*, "As Manager of Military Marketing at Submarine Signal Division of Raytheon in Portsmouth, R.I., hope to make major breakthrough in reducing the cost of SSN electronics procurement and installation—effectiveness should go up!"

The remainder of the column is based on information from news releases and the ever-faithful clipping service. In fact some months this column can be classified as a "clip joint."

Don Erb has become president of Electric Time Company, Inc., 16 Union Street,

Natick Mass. His company manufactures electric and electronic clocks and time indicating systems. Previously, he was with Ametek, Inc. Electric Time works with architects and engineers in the design of customized indoor and outdoor time and temperature display systems for institutional, business and industrial clients. . . . *Ed Hellier* is now technical assistant to the director of research and development, Abrasive Materials Division, Norton Company. Previously, Ed was technical manager of Norton A/S, the Norton electric furnace plant in Lillesand, Norway. . . . *Leo Pach* is the author of *Experimentelle Nachprufung berechneter Rohrleitungsspannungen*, published in *Forschung Im Ingenieurwesen*, 1968, No. 5, pp. 159-60. For those who "Deutsch nicht verstehen" the article, in English, is "Experimental Verification of Calculated Pipe Line Stresses."

W. Kenneth Davis, vice president of San Francisco based Bechtel Corporation, was one of the members of the 19-man organizing committee of scientists, engineers, academicians and administrators formed to support the successful election campaign of President Nixon.

Not for the inadequate

We are indebted to the Needham, Mass., *Chronicle* for the following article on *Doug Eckhardt*. The School Committee is one of the most important of Needham's governmental bodies. . . . "Heading the School Committee for this second successive term is Douglas Eckhardt, an engineer by training and profession. Eckhardt's understanding of educational matters exhibits the precision and the sensitivity of the practicing scientist. Under his chairmanship, the School Committee voted to establish a working relationship with METCO—one of the major symbolic breakthroughs in urban-suburban racial relations—and to construct two badly needed additions to the Hillside and Mitchell Schools. Mr. Eckhardt, whose speech and manner are mild frequently reaching whimsical, points out that many residents misunderstand the function of their School Board. 'In the first place,' he stated in a recent interview, 'we are a policy-making body, not an administrative organization. We are also completely independent of the power structure of the town. The School Committee derives its authority from separate state laws, and is independent of both the Selectmen and the Town Meeting.' This independence means; he added, 'that the quality of the School Committee depends completely on the quality of its members. So much power in the hands of inadequate persons could be extremely dangerous!'

Characteristic of Eckhardt's thoughtful and methodical approach to school matters is a recent meeting he planned concerning the unionizing of Needham's teachers. It is conceivable that the School Committee will have to negotiate with the teachers' union in the future. None of the School Committee members

had experience in negotiation. Chairman Eckhardt arranged a luncheon meeting with an authority in the field of professional negotiation, Dean Abraham Siegel of M.I.T.'s School of Industrial Management. As a result of the consultation School Committee Members will be far better prepared for any bargaining which may be done with the teachers' group.

"With the memory of New York City's paralyzing teachers' strike still vivid, Eckhardt was asked how he would react to a similar strike in Needham. 'It would be what we call a zero-sum game—a plus and a minus add up to zero,' he said. 'The students would lose, the parents would lose, the teachers would lose, everybody would lose.' Teaching conditions in Needham, he feels are good. He says the town salary schedule is among the top 10 in the state, and 'reasonable communication exists between the teachers, the administration and the School Committee. Applications for teaching positions continue to come in from all over the country, indicating that Needham's reputation as a good school system persists.'

"Asked to define the relation of the Superintendent of Schools to the School Committee, the chairman said that the School Committee generally accepts the advice of the Superintendent, on (sic) educational matters. Members carefully consider the pros and cons of his recommendations before determining policy. The School Committee meets between 20 and 24 times a year with the Superintendent, but still, Mr. Eckhardt finds, 'it's impossible to know enough of what's going on.' He describes this as the main frustration of his position.

"In addition to its policy-making tasks, the School Committee by law establishes and approves school budgets, approves teaching appointments, and reviews the expenditure of all funds.

"Recently Needham's Public School Association of which Chairman Eckhardt was formerly a director, has documented overcrowded conditions in several of the Needham schools. 'Overcrowding is a fact,' he admitted, 'but Needham, like most towns wants the best possible school system for the least amount of money. We will have to re-evaluate the process by which we get new schools. In some respects, we have to do a better job of "selling" the town on very real needs.'

"Mr. Eckhardt, the only man elected twice to the chairmanship of the School Committee, lives at 60 Eaton Road. He is a principal engineer (one of the top engineering classifications) with Raytheon's Missiles Systems Division. He oversees the work of 40 engineers. He was born in Pittsfield, and came to Needham in 1952. He received his B.S. and his M.S. in electrical engineering at M.I.T. He served for five years in the Army during World War II. Before joining Raytheon, he worked in electron-

ics at M.I.T. and Sylvania. When asked if he experienced any ethical conflict in doing weapons work, he replied in the negative. 'Somebody's got to do it. I've been in this field all my working life. I may as well contribute.'

"He is married to the former Lois Rockwood of Newton. They have three children. David is married and living in Williamsville, New York; Jane is a sophomore at the University of Maine; and another daughter, Mrs. Elizabeth McLaughlin, lives in Newton Highlands. A demanding career and an equally demanding public service post leave few hours for recreation. But when he relaxes, he indulges in a hobby of 34-years standing. He is an amateur radio buff, and finds that the pursuit 'completely relaxes me.' He also enjoys sports and photography.

"Before joining the School Committee, he served in several town organizations. He is a past president of the Needham Council of Churches, a past deacon of the Congregational Church and a past president of the Harris School PTA. He retains membership in the Institute of Electrical and Electronic Engineers." No news is not good news. Let's hear from you.—*Alvin Gutttag*, Secretary, Cushman, Darby & Cushman, 730-15th Street, N.W., Washington, D.C. 20005

41

Harlan E. McClure is currently Dean of the School of Architecture of Clemson University, Clemson, S.C. He is also National Secretary of the National Architectural Accrediting Board, as well as Consulting Architect to Charlotte, N.C. and to the South Carolina Tri Centennial Commission for the Tri Centennial Celebration in 1970.

Austin W. Fisher, Jr., is serving his second term on the Lexington, Mass. School Committee. He is also Professor of Engineering Management and Coordinator of the Graduate Program in Engineering Management at Northeastern University, Boston, a position he has held since July of 1967.

Mamerto E. M. Cruz is presently Manager, New Polymer Products Research and Development at the Chemical and Development Center of the F.M.C. Corporation in Princeton, N.J.

George E. Power has been named a Research Fellow at Formica Corporation's Research and Development Center in Cincinnati, Ohio.

Miles Ross was guest speaker at the annual banquet of the Daytona Beach Area Chamber of Commerce held at the Desert Inn last December. Miles is Deputy Director, Center Operations for the Kennedy Space Center in Florida. His responsibilities include operations related to engineering matters and the conduct of the Center's Technical Operations.

James E. Gordon reports: "Still alive! Still struggling! Ugh!" You will note that even those brief words are welcome "news," for while we would rather he enjoyed the "struggle," nevertheless, we are happy to learn that he is "Still alive!" How about the rest of you? Reports on your activities will be most welcome for this column.—*Walter J. Kreske*, Secretary, 53 State Street, Boston, Mass. 02109; *Everett R. Ackerson*, Assistant Secretary, 831 Cranford Ave., Westfield, N.J. 07090; *Michael Driscoll*, Assistant Secretary, 63 Center Street, Nantucket, Mass.

42

An interesting article by *Jack Sheetz*, Vice President of Tufts and head of its Office of Resources tells about the functions of his office. Quoting from the article "... The primary sources of gifts to any institution are its alumni and other close friends, including parents of students. Alumni, realizing how previous donors made their education possible, will give especially when they understand the purpose, the goals and the needs of an institution. Indeed, if the alumni will not support their Alma Mater, it is difficult to see why others would. But the type of support we need is not simply monetary; it is the support which results from the deep conviction inspired by a thorough understanding of an institution, its goals and the dreams of its leaders. ..." Applies to us at Tech too!

Postmarked from Carrollton, Texas, *Gene Hanszen* writes that Hanszen Plastics Corporation which he founded in 1953 was merged with Crompton and Knowles' Beetle Plastic Division as Western Sales Manager. ... From Whittier, Calif., *Joseph Boltinghouse* reports that he is currently Staff Scientist in the Inertial Instruments Engineering Department of North American Rockwell's Autonetics Division at Anaheim. ... As the conglomerates agglomerate (or do they proliferate?) it will become impossible to identify anyone's position in less than half a paragraph! ... *Charles Bien* has been appointed to manager of environmental engineering by GAF Corporation at Linden, N. J.

Joins the Nixon Cabinet

Most newspaper coverage recently, with no close competition, was *Robert Seaman's* selection as Secretary of the Air Force in the Nixon cabinet. Dr. Seaman has been the Hunsaker Visiting Professor in Course XVI for the past year. He was Associate Administrator of NASA from 1960 to 1965 and Deputy Administrator until 1968 when he returned to Tech. Interviewed by the Boston *Herald Traveler*, Dr. Seaman said, "We could have planned our lives a little better. ... We sold the house in Washington just two weeks ago and the house here in Cambridge is not finished but it was a question of getting aboard (i.e. back to Washington). ..." Sounds just like the travels and tribulations of a lot of our classmates!

Karl Wenk, President of Ritter Finance Company, has been appointed chief executive officer. He is also treasurer of Ritter, a position which he has held since joining the company in 1958. . . . Two items newsworthy about *Monroe Brown*. He was married in December to Mrs. Lucile Cortright of Jericho, Long Island and was promoted to Vice President of Kollsman Instrument Corporation in February. Brownie has been manager of Kollsman's systems division for the past three years. Congratulations on both.

Dave Friedman writes that his daughter has completed her B.S. in Math at Syracuse and is working for her masters there. Also met with *Adrian Marcuse*, *Bob Kraus*, and *Floyd Lyon* (with wives) at the recent M.I.T. Club of Long Island dinner.—*Ken Rosett*, Secretary, 191 Albemarle Road, White Plains, N.Y. 10605

43

I just had a note from *John H. Scott, Jr.*, of Towson, Md., with some very sad news which he asked me to relay to friends of '43. John writes, ". . . our older son, Steve, was lost on the second Allegheny Airlines crash in Bradford, Pennsylvania on January 6. He was returning for the final term of his sophomore year at the Bradford campus of the University of Pittsburgh. We were justifiably proud of his record as the number one engineering student. We are thankful for the 20 years of joy he brought into our lives. With the help of our many friends and faith in God we shall do our best to carry on." On behalf of all your classmates, John and Betty Scott and family, I send you our deepest sympathy for this tragic loss. We also join you in dependence on the same anchor, both in fair weather and in such stormy times as you've just gone through. . . . namely, our faith in God.

I can't remember exactly which Christmas it was—1963 perhaps—but my wife's reaction later on was, "It must be Jack's most popular Christmas gift since his first tricycle." The gift she was referring to was a Dymo labeler. Little did I know then—nor until quite recently—that this product of Dymo Industries of San Francisco has an M.I.T. '43 man promoting its rapid growth. *Rudolph Hurwicz*, who graduated in mechanical engineering, was featured in a *Time Magazine* business article last November in which it traced the remarkable growth of Dymo Industries of which he is president. "The labelers now come in 20 models in a choice of 21 languages including Greek and Japanese and with tapes in 26 different colors. . . ." said *Time*. Your secretary would like to add a note from his personal life in Japan during 1965 to 1967; there's a western-style house in Yokohama now sprinkled liberally with Dymo labels! I added my touch by re-labelling in English the elements in the Japanese fuze box—the maid translated the Japanese kanji writing and my trigger finger on the Dymo labeler did the rest!

Changing the subject, I guess some of our class members have been watching the Rowan and Martin Show on national TV for the class news seems to be coming through in "one-liners," if at all! Here are three items of recent vintage:

Gray C. Trembly writes: "I now work for Raytheon Company in the Bedford Laboratories." Verree interesting, Gray, but tell us more!

Visitors welcome?

John E. (Jack) Gardner, Jr., postcards some news from England: "I'm still responsible for corporate planning and manufacturing for Esso Africa, but as of December 1, 1968, our office moved from Geneva to London. We have bought a house in Kingswood, Surrey. Our two oldest daughters are married; Susan now living in Illinois and Ellen in Germany. Our first grand-daughter was born in Germany in late 1967." Adding a personal note as a friend (and fellow Esso employee) of Jack's, we wish them a most pleasant tour of duty in jolly olde England. Their new hometown of Kingswood, about 20 miles south of London, is in the "real English countryside" of the travel folders. It's right near the famous Epsom Downs racetrack, classmates. So if you've always longed to visit England in the spring and attend "The Derby"—well, you don't mind putting up a few M.I.T. classmates and families, do you Jack and Jane? What did you say your house address is?—it wasn't on the card!

DNA researcher

A recent release from Northwestern University mentioned a paper on research in molecular biology, "Molecules of Life" in which some work of *Robert L. Letsinger* was cited. Professor Letsinger of N.U.'s Department of Chemistry has contributed significantly to research involving the molecular structure of deoxyribonucleic acid (DNA) and the way this structure influences the passing of genetic information from one generation to another. Speaking for myself, "hats off" to Bob Letsinger of '43 and others who have advanced these studies over the years since we all graduated. Any of you who have offered to give you high school-aged son or daughter a hand with his biology homework know well that studies of DNA are prominent in their science curriculum, these days. The paper in which Professor Letsinger's work is cited is one of 17 reports on science, engineering and medicine research contained in the book *Toward the Seventies* which came off the press at Northwestern University last fall.

A ball of fire

Kenneth R. Wadleigh, Dean of Student Affairs at M.I.T., spent a recent evening with The Alumni Advisory Council in Cambridge reviewing the results of the Fall Semester as a take-off point for some extrapolations to 1969 and beyond at the Institute. Those of us who saw Ken at our 25th reunion last June will agree that "our" dean is still the ball of fire of undergraduate days! Keeping in touch with the young men and women

of M.I.T. is Ken's job and he's quick to comment that this is one sure way to keep the generation gap narrowed. Since we can't all do this for a living, Ken, how about an article in the *Review* some day? You might title it, "Learning a New Kind of Bridge Building at M.I.T.—Bridging the Ellusive Generation Gap!" (See March *Technology Review*, p. 95, Alumni Advisory Council: A Dean's Statement of Principle.)

Benjamin F. Helm has been named superintendent for meteorological balloon production at Dewey & Almy Chemical, Cambridge. . . . Well, gentlemen of 1943, as you can plainly see, your secretary has managed to take a few small scraps of "meat" and has sauteed a concoction of news—call it Hash a la '43—by adding a liberal quantity of my own "starch." if you find it palatable, I'll chef it again. But there is a minimum amount of "meat" required for even the poorest quality hash. So please—let's have your meaty contributions for the next issue. . . we'll even accept high quality bologna!! —*A. J. Kelly, Jr.*, 34 Scudder Road, Westfield, N.J. 07090

44

I wish to thank *Paul Heilman* for writing the notes for March. The first item this month is a correction to the January notes where I stated that three classmates had sons who entered M.I.T. last fall. Within a few days I received a letter from Martin King reminding me of our discussion last September at the Alumni Officers' Conference when he told me that his son Dick was entering as a member of the Class of '72. Martin and I had even discussed a computer program Dick had written and the marketability of such software. I was particularly vulnerable because the conversation with Marty was part of the reader canvass which I reported in the December notes.

I immediately wrote to Marty apologizing but expressing my appreciation that he was indeed reading the column. The omission of Marty and Dick from the list in the January notes was a failure on my part, first to report the news as an item in the December notes when I discussed the Conference and, second, to note that Marty and Dick King had been omitted from a list furnished to me by the Alumni Association and used for the January notes. I still do not have the names of students in other classes who have parents or other relatives in the Class of 1944. I know that *Al Picardi's* son, Tony, is now a junior at M.I.T. and that *Malcom Kispert's* son, William, graduated last June with the Class of 1968. Any others?

We have notes from four classmates via the Alumni Fund envelope flaps. These get high priority in reporting. *Anne Rafferty* wrote on December 2 from Marblehead, Mass., that she is a housewife, civic terror, hockey coach, birdwatcher and member of the Recreation and Park Commission. . . . *Harold W. Schuhle* wrote on December 5 from Pittsfield,

Mass., that living in the Berkshires is very enjoyable even though the architectural offices are somewhat limited in size and scope. He says, "With just 20 minutes a day for commuting, our sailboat at the end of the street, Tanglewood, summer theatres, three ski areas within ten miles, and opera at Lake George, we venture to New York only for long weekends. Two of our four children are approaching college age which brings both memories and some concern, but no serious generation gap yet." That is an attractive word picture which Harold paints.

H. Bruce Fabens wrote on December 17, from Cleveland, that he had just been elected Vice President (Finance) of Lamson and Sessions and that he was looking forward to the 25th Reunion in June. Bruce's name is on the list, mailed in mid-January, of the 80 classmates who by then were definitely planning to attend the reunion. . . . *Henry N. Boses*, 3102 Bayou Drive, La Porte, Texas, wrote on December 26, that the Boses family was off for a week of skiing at Taos, N.M. and would be with the Henry C. Bourne family, Rice University, Houston, Texas, at New Years. Thanks to all four of the above who used the Alumni Fund envelopes to write notes.

In the personal category and via Burt Bromfield, I have received a copy of the Christmas letter from the *Mario Banus* household, Topsfield, Mass., to family and friends. It appears that Mario has been a grandfather since January 7, 1968, when David Douglas Banus was born to Mark and Mag Banus. The grandson resides with his parents in Brookline near Boston University where Mario's son is an undergraduate following four years service in the Air Force. Mario's other children are Chris, a junior and chemistry major at Brown University, whose engagement to Lynn Montgomery was announced this past Christmas; Greg, a sophomore at Harvard; and Nate, a sophomore at Masconomet Regional High School. Burt tells me that Mario's first wife died several years ago.

In addition to becoming a grandfather last year, Mario has become a husband again. In fact the letter appears to have been written by his bride, Barb, for the letter contains the following: "All in all, it has been an eventful and satisfying year for the Banus family, particularly for Barb who is decidedly content with her decision of a year ago to join the family last March 2, 1968." Barb is a half-time occupational therapy faculty member at Boston University and a consultant at Hawthorne State School for the retarded.

Elsewhere in this delightful letter we learn that Mario and Barb sailed every weekend from May to November and took a nine-day cruise to Cape Cod and the immediate islands.

The clipping services have supplied us with three items. From the Hartford *Courant* of December 3, we learn that *John E. Yocom* (photograph appears on p. 154 of this issue) of Simsbury, Conn.,

has been named a diplomate of the American Academy of Environmental Engineers after successfully completing a special examination given earlier in 1968 by the Environmental Engineering Inter-society Board, Inc. . . . Next we have a quotation. "It's our own lack of foresight, dearth of adequate planning, or pecunious penny-pinching that keeps in the marketing field from enjoying the fruit of our electronic data processing efforts," *Will B. Rodemann*, Director of Corporate Marketing at Varian Associates, Palo Alto, Calif., told those present in New York last October at the 16th Annual Marketing Conference of the National Industrial Conference Board, according to a story in *Industrial Marketing* of November 1968. Will's scheduled appearance on the conference program was noted in this column for October/November. I last saw Will in May, 1966, in Arlington, Va., at a symposium on Source Data Automation sponsored by the General Services Administration. He had just been transferred from Washington, D.C., to Charlottesville, Va., and was still commuting.

About two years ago, when he moved to California, Will sent me a change of address card, announcing his move, the only classmate ever to do so in the three years that I have been secretary.

Here's the last one. *James B. Angell* is the senior of three Stanford University authors of an interesting article titled "The World of an Educator" published in the November 1958 issue of the *IEEE Student Journal*. Jim is professor of electrical engineering at Stanford University. After receiving his S.B., S.M., Sc.D. degrees from M.I.T., Jim was with Philco Corporation until 1960 when he joined the faculty at Stanford. One of the other authors is Hugh M. Skilling, '30, VI, S.M.

New addresses available from me on request have been received over the past two months for the following 32 classmates: *William G. Abbott*, 3d; *Henry L. Alden*; *William L. Brice*; *Edward H. Bohn*, Jr.; *Edward M. Coan*; *John T. Cooper*; *Robert H. Cummings*; *Warren B. DeLano*; *Austin P. Dodge*; *Louis H. Goddard*; *Walter Hanstein*; *Albert P. Hildebrandt*; *John H. Helve*; *Martin C. Hird*; *Robert D. Hoss*; *Austin T. Hunt*, Jr.; *Kenneth W. Joseph*; *John H. Kellogg*, Jr.; *Bruce Kirton*; *William W. McConnell*; *Robert A. Metzger*; *Kenneth W. Nelson*; *Augustus Polemis*; *Geoffrey Robillard*; *John B. Rosenquest*, Jr.; *Robert B. Schick*; *Charles L. Sollenberger*; *Thor H. Stromsted*; *Pierre E. Teets*, Jr.; *Dr. Shou I. Tsien*; *Dr. Donald A. Tucker*; and *Craig Williams*. That's all for this month.—*Paul M. Robinson*, Jr., Secretary, Information Systems Division, Navy, Op-914H, Pentagon 2B330, Washington, D.C. 20350, 202-697-6115, or 7710 Jansen Drive, Springfield, Va. 22150, 703-451-8580; Assistant Secretaries: *Paul M. Heilman*, Copper Development Association, 405 Lexington Ave., New York, N.Y. 10017 or 30 Ellery Lane, Westport, Conn. 06880; *Dr. John G. Barnby*, I.I.T. Research Institute, 1825 K St., N.W., Washington, D.C. 20036, 202-296-1610

46

We received an interesting note from *Lewis T. Mann, Jr.*, who in the late fall of 1968 was stationed at the VA Hospital at Newington, Conn. He was awaiting confirmation of his appointment to the faculty of the Medical School of the University of Connecticut at Farmington as Assistant Professor of Pathology and Immunology. Before moving to the Hartford area, Lewis, his wife and three children had been in Europe for two and a half years, living in England and Denmark during that time. They spent their last six weeks before returning to the U.S.A. on a trip through Holland, Austria, Germany, Hungary, Poland and Czechoslovakia. They left Czechoslovakia only two days before the Russian occupation, and were very happy to return to the U.S.A. Lewis is very impressed with the Hartford area and is now residing at 15 Ivy Lane, Newington, Conn., 06111.

Roger Sonabend, President of the Hotel Corporation of America, is preparing an article titled, "American Industry and the Urban Problem," to be published in a late spring or early summer edition of *Technology Review*.

Robert M. Adams, Course VIII, is the Director of the Oriental Institute and Professor of Anthropology at the University of Chicago. His department has received a grant of \$120,000 from the Ford Foundation to help train graduate students while on archaeological expeditions to Turkey, Spain, Greece, Ethiopia, Iran and Iraq. It will be Bob's responsibility to administer this fund during the next five years as well as his regular duties at the University of Chicago.

John A. Seerie, Course XIII, has been named Vice President of Engineering of the Ingalls Shipbuilding Division of Litton Industries. John will direct the engineering of the ships to be built in the present shipyard and the adjacent shipyard now being built. John served as a naval officer aboard destroyers during both World War II and the Korean War. After leaving the Navy in 1953, John was employed at Electric Boat Division of General Dynamics and became director of design engineering in 1965.

William S. Gale has been named vice president in charge of research and development at Gillette Toiletries, Boston.

Walter J. Loughlin, Course VI, has been recently appointed as assistant to the vice president for copier products of Pitney-Bowes, Inc. Walter joined Pitney-Bowes in 1947 and was employed in various engineering assignments in the U.S.A. until 1960. Headquartered in England in 1960 he served as engineering and manufacturing manager of the firm's international division until he returned to Stamford in 1967. Walter now lives in Cos Cob, Conn.

William Frederick has had varied and interesting years of achievement after grad-

uating from the Institute in 1946. After receiving advanced degrees at the Art Institute of Chicago, he began a period in industry as a design engineer and in teaching as an instructor in physics and mathematics before becoming a silversmith and designer. Some of his commissions as a silversmith designer include a ring for the Dalai Lama and a chalice for St. James church in Chicago. Bill's works have been featured in showings at the Museum of Contemporary Crafts, New York, at the Museum of Natural History and the Art Institute of Chicago.

Ned A. Spencer, Course VI, has been elevated to the grade of Fellow by the Board of Directors of the Institute of Electrical and Electronic Engineers effective January 1969. The grade of Fellow is the highest membership grade in the I.E.E.E. and is an unusual distinction. Only 127 awards were made from this technical society of a 160,000 world-wide membership. Ned received his award for outstanding technical and managerial leadership in the development of antennas for radar and communications.—*Russ Dostal*, Secretary, 18837 Palm Circle, Cleveland, Ohio 44126

47

Gil Parker's move from New York City to Tranquility Road in Suffern, N.Y. sort of pinpoints my mood on a beautiful winter day. Yesterday our whole family made a jaunt to Peak and Peek, N.Y., for a day of skiing and this morning I had a very early start for church and speed skating races with second son. Now it should be a day of tranquility except the *Review* had a scheduling goof and these notes are due.

I trust *Gil Parker* is still with IBM though I haven't seen him for many years and may be incorrect. . . . *Marv Sweeney* is still with TRW having just been transferred from California to Texas to manage their new Aeromechanics Lab in Houston. . . . In the early fall in San Francisco, *Oliver Moles* was a panelist discussing "Social Change and the Poor." This was one of many subjects covered in the annual meeting of the American Psychological Association with 10,000 attendees. . . . *Walter Rotman* was elevated to Fellow by the I.E.E.E. for his contribution to antenna technology and to the better understanding of the interaction of electromagnetic waves with plasmas. . . . *John Barrett* was elected president of the Chamber of Commerce for the South Middlesex area of Massachusetts. John is chief engineer of Massachusetts for the N.E. Telephone Co., and resides in Needham with his wife Veronica and their five children ages 10 to 22.

A couple of months ago we reported the death of *Fred Paradise*. *John Williams*, through correspondence with Fred's mother, has written giving a few details of Fred's career. Following graduation, S.B. E.E., February 1947, Fred served as

an electronics officer aboard the U.S.S. Toledo. After service, he was a Teaching Fellow at the Graduate School of Harvard University majoring in Comparative English Literature. Fred's industrial experience included the following positions: Executive Engineer with Underwriter's Laboratories conducting research on the thermal effects of electrical currents in steel structures; Project Engineer at G.T. & E. responsible for new product planning; Systems Development Manager for I.T.T. engaged in development of communications systems; and Preliminary Design Engineer at California Technical Industries responsible for the automated test equipment used in conjunction with the Minuteman guidance system.

At the time of his death in February 1968 from a heart attack, Fred was Research Engineer with the Boeing Company. He was assigned to the Systems management Group of the Saturn rocket. Dr. Wernher von Braun, Director of the George C. Marshall Space Flight Center, in a letter to Mrs. Paradise said that her son had earned the highest respect and admiration of his colleagues in the U.S. Space Program, and praised the importance of Fred's role in the development of the Saturn launch vehicle. Thanks John.

Fred Sylvander has been appointed to the M.I.T. Educational Council working in northern New Jersey where he is senior engineer for Bendix. . . . *Paul Bock* in addition to his other affiliations has now joined the faculty at the University of Connecticut as professor of hydrology and water resources. . . . We are leaving at the end of the month for 10 to 12 days of skiing at Vail and Aspen, so there is a pretty fair chance that the '47 notes may miss the next issue. Drop a line.—*Dick O'Donnell*, Secretary, 28516 Lincoln Rd., Bay Village, Ohio 44140

51

Rudolph W. Billing, Jr., of Littleton, Mass., dropped us a card indicating that he is still with AVCO Corporation. . . . *Edward L. Bronstein, Jr.*, of St. Paul, Minnesota, represented the Institute last May at the inauguration of the University of Minnesota's tenth president. Coincidental with this announcement, we received an extensive write-up on Ed which appeared in a Minneapolis newspaper under the title: "About People." The lead line in the article read, "St. Paul's Northwestern National Bank took note of (Ed). . . . as a man of stature in the business community and honored him with election to the Bank's Board of Directors." Ed was named President of the United States Bedding Co., last May and continues as a very active member of the St. Paul community. His civic involvements include past president of the Chamber of Commerce, the Civic Opera Association, Rotary Club, and so on. Ed's wife, Elsa, is also known for her participation in local activities. In addition, Ed has served the

M.I.T. community as President of the Twin Cities M.I.T. Club, and he is currently the Regional Chairman of the Educational Council.

Roger Baumann is presently a Professor in the Electrical Engineering department at Lowell Technological Institute. He wrote that he left Paris, France after five glorious years. . . . *Charles A. Compton* is at Phillips Exeter Academy in Exeter, N.H. He was the planning officer and an instructor in science, and he is now head of the Science department. His wife, Elizabeth, and children Lisa, Karl and Carol Ann share the living in beautiful N.H. . . . *Oscar Falconi* wrote from nearby La Jolla, Calif., that he was with Digital Development Corporation and that his activities include job-hunting. I hope that he's comfortably settled by now and enjoying his hobbies of "doing everything and nothing." . . . *Frank E. Heart* left Lincoln Laboratory and is now the Director of the Information Technology Division of Bolt Beranek and Newman.

Bill Hewitt, in his 13th year with Union Carbide, is handling the activated carbon market for their Carbon Products Division. He travels, and last year visited his wife Anne's home country: Norway. He also visited Sweden, Denmark and England. Before moving from Crofton, Md., to his present home in Olmsted, Ohio, Bill had the distinctive thrill of hitting his first hole-in-one at the Crofton Golf Club. . . . *David Jeffries*, S.M. VIII, his wife Marjorie and their five children, ages four to fourteen, sent New Year's greetings from Waltham, Mass. . . . *Wilbur Leventer*, S.M. I, is Assistant to the President of Charles E. Smith Construction Company. He and his wife Barbara live in the Washington, D.C. area and have three children. . . . *John M. Luger* is an analyst with Naess and Thomas, Investment Counsel in the N.Y. area and is still single.

Hays Penfield was among a group of astronomers who discovered a previously unobserved line of microwave radiation at 6.3 centimeters in the direction toward a gaseous nebula in the constellation Cassiopeia known as IC 1795. The discovery was announced last April at a meeting of the American Astronomical Society. Hays is with Harvard University. The observations were made with the 140 foot radio telescope at the National Radio Astronomy Observatory at Green Bank, W. Va. . . . After teaching at the University of Florida for ten years, *Roy W. Niemela* has taken a position with the Bureau of the Budget. He is an economist in the Director's Office. He, his wife Corinne, and their three children are living in Wheaton, Md. . . . *William E. Philhower* is a Research Supervisor in the fiber and paper division of the NVF Company research and development laboratory at Yorklyn, Del. . . . *Winfield O. Salter* was a vice president of Parsons, Brinckerhoff, Quade and Douglas, in their San Francisco office, and is

now a partner in the firm. He had been Project Manager for the design of the Bay Area Rapid Transit System in San Francisco and for planning a rapid transit system for Atlanta, Ga.

John Stewart, Jr., writes that he is "still with the Reading Tube Corporation which I joined on graduation from Tech. I am now a senior Vice President operating three plants—a copper refinery, a non-ferrous tube mill, and a non-ferrous fabrication mill." John and his wife June have five children. . . .

Herbert Ullman wrote that he and his wife, Conchita, have moved to 47 Mosman Street in West Newton, Mass. . . . *Louis Weinberg*, Sc.D. VI, is a professor of Electrical Engineering at City College, New York. He teaches advanced network theory, network synthesis and linear algebra and supervises doctoral theses in matrix theory and distributed parameter systems. Wow! He was a Vice President of Conduction Corporation before he started teaching.

I. Victor Yancey is presently the Engineering Manager for the Airframe Subsystem in the F-5/T-38 System Program Office at the Aeronautical Systems Division, Wright Patterson Air Force Base. He and Ida and their four children are still living in Dayton, Ohio. . . . This month the notes were brought to you by Marshall Alper, Assistant Secretary 1130 Coronet Ave., Pasadena, Calif. 91107.—*Howard L. Livingston*, Secretary, 358 Emerson Rd., Lexington, Mass. 02173; Assistant Secretaries: *Paul G. Smith*, 11 Old Farm Rd., N. Caldwell, N.J. 07006; *Walter O. Davis*, 346 Forest Ave., Brockton, Mass. 02401

54

John Cleveland is working for the Planning Research Corporation in Washington, D.C. . . . *Robert Duncan* is chairman of the Management Committee for Science and Technology at Polaroid Corporation. He had been an assistant director for Systems Research at NASA's Electronic Research Center in Cambridge. . . . *Paul Gray* is Class of 1922 Professor at M.I.T. as well as serving as Assistant Provost. The Class of 1922 Professorship "was established for the purpose of rewarding and encouraging superlative teaching." Professor Gray has given much of his attention to teaching and remains in charge of a course for sophomores in electronic devices and circuits. As assistant provost, Professor Gray continues to give special attention to undergraduate instruction, especially that in the freshman year. Professor Gray, wife Priscilla and four children live in Winchester.

Joseph Hurley has been appointed manager of finishing engineering in the technology group at Corning Glass Works, Corning, N.Y. Last year, he was chosen treasurer of the St. Lawrence County Chamber of Commerce. Joe has been with Corning since 1955. . . . *Jack Kinstlinger* has been appointed Director

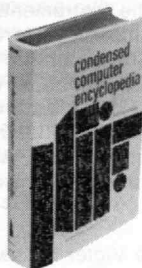
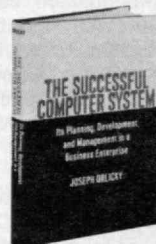
Both management and computer professionals will find more effective use of computers in these important books from McGraw-Hill

THE SUCCESSFUL COMPUTER SYSTEM: Its Planning, Development, and Management in a Business Enterprise.

By **Joseph Orlicky**

Industry Consultant, IBM Corporation

The first all-out look at computers from the management (not technological) viewpoint. Based on experience gained in actual practice, it covers principles and considerations pertaining to all commercial applications. Includes the problems that plague most business installations. An invaluable guide to the profitable use of computers in your organization. **226 pages, 6x9, 33 illustrations, \$9.95**



CONDENSED COMPUTER ENCYCLOPEDIA

By **Philip B. Jordain**

Now top management and systems men can understand each other. The complex technical jargon of today's business systems (Algol, Telcomp, etc.) is explained here in words that both can use. The book is a guide to "computers" for top management, a basic reference source for systems men, and an invaluable communications link for both. **604 pages, 6 1/2 x 9, \$14.50**

DIGITAL COMPUTER USER'S HANDBOOK

Edited by **Melvin Klerer and Granino A. Korn**

You will find answers to virtually every question on today's digital computer procedures in this single comprehensive volume. Emphasis throughout is on practical applications. Outstanding experts in each specialty, cover every important aspect of all current computer usage. An indispensable manual for daily reference. **922 pages, 6x9, 157 illustrations, \$27.50**



At your bookstore

10 DAYS FREE EXAMINATION

McGraw-Hill Book Co., Dept. 23-TR-469, 330 West 42nd Street, New York, N. Y. 10036
Send me the book(s) checked below for 10 days on approval. In 10 days I will remit for book(s) I keep, plus a few cents for delivery costs, and return others postpaid. Include local sales tax if applicable.

- ☐ Orlicky, **THE SUCCESSFUL COMPUTER SYSTEM**, \$9.95
☐ Jordain, **CONDENSED COMPUTER ENCYCLOPEDIA**, \$14.50
☐ **DIGITAL COMPUTER USER'S HANDBOOK**, \$27.50

Name (print) _____

Address _____

City _____

State _____

Zip Code _____

This offer good in the U.S. and Canada only.

23-TR-469



John V. Parrish, Jr., '55

of Advance Planning of the Pennsylvania Department of Highways, Harrisburg. Prior to this position, he was associated for 11 years with Tippetts-Abbett, McCarthy-Stratton, Engineers and Architects of New York City. During that period he served in several capacities including manager of the firm's New England branch office.

Leonard Kranser has been named President of the Miller Dial and Nameplate Co., El Monte, Calif. . . . James McCauley is Vice-President of Research, Development, and Engineering at Crucible Steel Corporation. Robert Rohner was recently appointed as Chief Process Engineer for the Stone and Webster Engineering Corporation in Boston.

New company formed

Three Course 1 classmates have formed a company, Soil and Rock Instrumentation, Inc., which will provide consultation, design, installation and maintenance, data acquisition and reduction, and analysis services in instrumentation systems for soil and rock mechanics. The classmates are William Zoino, (the president), Donald Goldberg and Steve Poulos and Stephanos Hadjiyannis of the Class of '58.

Charles E. Shaw coauthored "Acquisition Analysis: Consider Your Shareholders" in the December *Financial Executive*. . . . Thomas Chase coauthored "Evoked Release of Norepinephrine and Serotonin from Brain Slices: Inhibition by Lithium" in the October *Science*. . . . H. F. Pohl coedited a new book on electrochemistry, *Electrophoretic and Dielectrophoretic Disposition*. See you at the reunion.—E. David Howes, Jr., Secretary Box 66, Carlisle, Mass. 01741

55

Back from Vietnam, Lieutenant Colonel John Parish, S.M., is attending the U.S. Army War College, where he will complete the ten-month course in June. He and Peggy live at the college in Carlisle Barracks, Pa. . . . Last summer Colonel Clyde Friar, S.M., completed a three-year tour of duty as Director of the Defense Development and Engineering Laboratories at Edgewood Arsenal in

Maryland and then went to Arkansas to become Commander of the Pine Bluff Arsenal. . . . Robert Baker, who is with Sikorsky Aircraft Division in Stratford, Conn., was a member of the Institute last summer.

The Electronics Research Center of NASA in Cambridge did some reorganizing late last year; as a result Frank Tung, of West Newton, heads a group concerned with computer and guidance technology, and Leo Keane of Wellesley Hills, a communications and navigation satellite programs group. Dan Brown, newly appointed Manager of Market Development for the Instruments Department of Ionics, Inc., in Watertown, is marketing new equipment for control of air and water pollution. . . . Frank Leitz, also with Ionics, delivered a couple of papers last April at the Electrochemical Society meeting. Frank, III, was born in June, joining brothers Edward, four, and Karl, two.

Francios Claude Vigier is now Professor of City Planning at Harvard as well as President of Nash-Vigier, Inc., planning consultants in Cambridge. A student of the historical development of cities, he is working on a study of historical urban structures. His planning projects have included designs for Palestine, Havana, Chile, Expo '67, and the Boston Government Center.

The *Lindenlaub* Christmas letter this year came from Andover, Mass., where John is doing research at the Bell Telephone Laboratories, taking a one-year leave of absence from Purdue. The whole family enjoyed the New England summer and seem to be every bit as busy in Andover as they were in Indiana. . . . Karl Reuther, Executive Vice President of Reuther Mold and Manufacturing Company, writes that he has been campaign chairman to raise funds for a new junior and senior high school north of Cuyahoga Falls, Ohio, to be called the Cuyahoga Valley Christain Academy.

From St. Louis Frank Curran reports that he and Jeanette became parents of a third son, David James, last August. Frank is with McDonnell Aircraft. . . . Walter Shifrin, principal associate in the consulting firm of Horner and Shifrin,

Inc., of St. Louis, writes of the arrival of his and Jennifer's secondborn, Jeffrey Thomas, last July. . . . Bill Friedman has become Administrative Vice President of Younker Brothers, Inc., a Des Moines, Iowa department store.

From Dallas, Texas, Norry Hersey (he is Chief of Systems Development for the Army and Air Force Exchange Service) reports that he has traveled on business this year not only to Nurmberg, Germany, home to the Hersseys for about eight years, but also to London and later to Honolulu, Seoul, Tokyo, Bangkok, Saigon, and Hong Kong. He complains (?) that he doesn't see many '55ers in Dallas (maybe because he's not there?).

Harlan Walker mailed a note from "beautiful downtown Burbank" (actually he and Jeri live in Lakewood). The Walkers vacationed this year out West—Yellowstone, Glacier, Banff, and Spokane. Harlan is with Lockheed in Burbank. . . . Finally, the M.I.T. Club of Detroit must have a new president, for John Erickson, the duly elected one for this year, is now in Adelaide, Australia, with Chrysler, Australia, Ltd.—Secretaries: Mrs. J. H. Venarde (Dell Lanier), 16 South Trail, Wilmington, Del. 19803; L. Dennis Shapiro, Aerospace Research, Inc., 130 Lincoln Street, Boston, Mass. 02135

56

These notes are getting off to a slow start aboard a transcontinental jet. How well they proceed largely depends on how intriguing the movie turns out to be. . . . Since we're on the subject of airplanes, it's a good time to call your attention to the November 25 issue of *Aviation Week* which reports on a transport noise reduction conference at Langley Research Center. Alan March was author of a paper about his work in this area with McDonnell Douglas Corporation. . . . In another branch of aviation, a delayed news clipping tells us that Marvin Bahnmann, already a successful flying club operator, has now become an airport operator, signing a contract with the Carroll County (Ohio) Airport Authority.

Still up in the air, Air Force Captain John C. Frishett has entered the Univer-

sity of California to work toward a Ph.D. Meantime, Major Lawrence Schell, of the Army, is attending a 10-month course in advanced military leadership at the Air Command and Staff College at Maxwell AFB, Alabama. . . . Finally, and this clipping is nearly a year old now, Richard Peskin is (or was) heading up a joint heart research project between the Rutgers Medical School and the College of Engineering. Dick came to the job as Associate Professor in the Department of Mechanical and—you guessed it—Aerospace Engineering. Bring us up to date, Dick. . . . Getting back to earth, and taking a look at the legal department, Jesse Rothstein, a Partner in the New York City patent law firm of Amster and Rothstein, is living in Purchase, N.Y., with his wife and two youngsters. Is that the Amster?

An engraved announcement tells us that Ed Baker has joined the firm of Rubin, Wachtel, Baum and Levin, also in the big city. . . . The medical world: Howard Trachtenberg is Director of Clinical Anesthesia at Beth Israel Hospital here in Boston. (Here? I must be over Denver now.) He is associated with the Harvard Medical School, and delivered a paper in London last September on transport of injured patients. . . . Philip Bryden is Associate Dean of Graduate Affairs at the University of Waterloo. His big news is that he has received an NRC Senior Research Fellowship and plans to spend a sabbatical at the Psychology Department at M.I.T. Welcome, Phil. . . . Lamar Washington and some associates from M.I.T., Woods Hole and Harvard have formed a company, ORCA, Inc., of which Lamar is president. The initials stand for Ocean Recovery Corporation of America and their field is the recovery of minerals from the seas. That's gold in them thar waves!

Professor Bruce Wedlock of M.I.T. has taken the family to Berlin where he is visiting professor at the Technische Universität Berlin. He returns next September—just about the time his new text *Electronic Components and Measurements* hits the market place. Prentice Hall is the publisher. . . . Paul Hamburger has become Manager of Advanced Development at DIAL-DATA, Inc., in Newton, Mass. He and Paula have two children and live in Lexington.

Robert S. Scher, who is now Manager of the Encoder Engineering Department at Sequential Information Systems Inc., in Elmsford, N.Y., reports a year-old daughter, Sarah Elizabeth. . . . Paul Polishuk tells us that J.E.P. Davis and wife, Gretchen, recently became parents of a boy, Blake, Joe is Chief Engineer with Bennett Oxygen of Los Angeles. But get this. He lives in Malibu, because that's where his catamaran is berthed. I gather from condensed notes that he is the California champ in his class, and seriously looking for larger competition. Olympics, maybe? . . . Well, according to the clock, we ought to start our descent soon. The movie's over, and so are these notes. Best regards to all of you down there this February 17 (which by the new Massachusetts law is George Washington's birthday—this year).—Co-secretaries: Bruce B. Bredehoff, 16 Millbrook Road, Westwood, Mass. 02090; T. Guy Spencer, Jr., M.I.T., Room E19-439, Cambridge, Mass. 02139

57

George Moy dropped a note to advise us that he has formed a company with seven other hopefuls called OMEGA-T Systems. Generally the firm is involved with electronics design, manufacturing and consulting. Their products, he advises, include servo control systems for 100 foot diameter, satellite communications antennas; solid state RF switches; and amateur ratio test equipment. He is now living in Dallas. . . . Apparently Bob Turano's wife reads *Technology Review* for he writes, "I was married in September 1965 to a wonderfully bright, sweet, sensitive, domestic, hardworking devoted girl. I have been in school since 1940."

Bob Van Benschoten is now a Research Engineer at the U.S.M. Corporation in Beverly, Maine. . . . From Norman Peterson we received the following message recently: "After graduating from M.I.T. (Course III) I stayed on at Tech and received my doctorate in 1961 in metallurgy. I then joined the Metallurgy Division at Argonne National Laboratory where I have remained except for one year at A.E.R.E. Harwell, England (1964—1965) on an N.S.F. Fellowship.

I am presently Associate Division Director of the Metallurgy Division. I am married. We have no children."

The biographical sketch of Ron Howard in the *I.E.E.E. Transactions on Systems Science and Cybernetics* recently is quite impressive. I quote from it in part, "Ron Howard received the S.B. degree in electrical engineering and economics in 1955, the S.M. degree in electrical engineering in 1956, the E.E. degree in 1957, and the Sc.D. degree in electrical engineering in 1958, all from the Massachusetts Institute of Technology, Cambridge. He served as Assistant Professor of Electrical Engineering at M.I.T. from 1958 to 1962, when he became Associate Professor of Electrical Engineering Associate Professor of Industrial Management, and Associate Director of the Operations Research Center. Since 1965 he has held the position of Professor of Engineering-Economic Systems at Stanford University, Stanford, Calif., where he also holds appointments as Professor of Management Science in the Graduate School of Business and Professor of Decision Science in the Department of Operations Research. He has served as a Consultant to Arthur D. Little Inc., Stanford Research Institute, and the General Electric Company on problems ranging from consumer marketing to missile defense. He has written on decision analysis, probabilistic modeling, and operational systems and is the author of *Dynamic Programming and Markov Processes*. He is currently serving as editor of *Management Science*, as associate editor of *Operations Research*, and as series editor for John Wiley and Sons, Inc. Dr. Howard is a member of Sigma Xi, Tau Beta Pi, Eta Kappa Nu, the Operations Research Society of America, the Institute of Management Sciences, the Operational Research Society (U.K.) and the Society for Industrial and Applied Mathematics. He is Past President and Chairman of the Council of the Institute of Management Sciences."

In the same issue of *I.E.E.E. Transactions* there was also a biography on Dick Smallwood. "Richard Smallwood, born in Portsmouth, Ohio, on October 9, 1935

received the S.B., S.M., and Sc.D. degrees in electrical engineering from Massachusetts Institute of Technology in 1967, 1958 and 1962 respectively. From 1961 to 1964 he was a First Lieutenant with the U.S. Air Force in the Applied Mathematics Branch of the Cambridge Research Laboratories, Bedford, Mass. He joined the faculty at Stanford University, Stanford, Calif., in 1964 and is presently an Associate Professor in the Department of Engineering-Economic Systems and the Department of Electrical Engineering. He is currently a consultant to Bolt, Beranek and Newman, Inc. and the Stanford Research Institute. His research interests include medical care systems analysis, mathematical modeling, man-machine systems, and decision analysis. Dr. Smallwood is a member of Tau Beta Pi, Sigma Xi, Eta Kappa Nu, and the Operations Research Society of America."

A news release from Harvard University advises us that *Bob McLaughlin* has been appointed an Assistant Professor in Harvard's Faculty of Arts and Sciences. Bob works in systems analysis and is developing a course with the Harvard Medical School on the application of systems analysis to physiological problems. . . . *Stanley Cortell* is now an instructor in medicine at Tufts University School of Medicine and Assistant Physician at New England Medical Center Hospitals. . . . A news release in September 1968 from the Pennsylvania United Citizens for Nixon carried the news that *Uzal Martz* served as Central Pennsylvania Coordinator for the United Citizens for Nixon-Agnew. Working out of Harrisburg, *Uzal* coordinated campaign efforts in 18 counties. The news release continued: "Mr. Martz, a Director of the Pottsville "Republican," has served as Legislative Assistant on the U.S. House of Representatives Committee on the Judiciary.

His other professional experience includes management positions with General Electric Company, Corning Glass Works and Standard Oil Company of New Jersey. He is Secretary of the Esso Toastmasters Club, a member of Toastmasters International, a member of the U.S. Jaycees and holds a local and national officerships in various service and honorary organizations. A native of Pennsylvania, Mr. Martz attended Pomona College in Claremont, California where he was awarded his AB Degree in Liberal Arts. He subsequently received his SB Degree in Electrical Engineering from Massachusetts Institute of Technology, Cambridge, Mass. and his SM Degree in Industrial Management from the Sloan School of Management at M.I.T. Mr. Martz is married to the former Carroll Jun Briscoe and they live in Pottsville, Pa."

Laurence Young provides us with a neat 10 years summary. "I live in Newton Centre with my wife Jody (Fisher—Radcliffe '56), and son and daughter in Victorian ante-modernity. I am

Associate Professor of Aeronautics and Astronautics at M.I.T. and director of the Man-vehicle Laboratory which keeps me involved in bioastronautics, medical engineering and man-machine systems. . . . *L. B. Andrews* writes that he decided to join the half dozen or so M.I.T. alumni living within the Adirondack park. He bought the Western Auto Store in Saranac Lake, "a very nice place to live." He teaches physics at the local high school and math at the new North Country community college. Also he writes that he is President this year of the local Unitarian-Universalists Fellowship. His wife Margaret works part time in Social work in Lake Placid. They have two children aged 6 and 3. He concludes, "the quiet life and healthful climate has done wonders for us all." . . . *Tom Roberts* recently became Director of the Courses Division of the Bureau of Industrial Relations at the University of Michigan. He is active in consulting, writing and management training. He writes that he will be speaking at the Earthmoving Industrial Conference sponsored by S.A.E. in Peoria this April. . . . More to say after the first of May.—*Frederick L. Morefield*, Secretary, 18 Whaddon House, William Mews, London, S.W.1.

59

Though it's probably quite unnecessary for me to remind you that the 10th Reunion is rapidly approaching. If you haven't already done so, get those reservation cards in to Wentworth-by-the-Sea so that you can join the happy hoardes of '59ers there on June 13, 14, and 15. I won't try to go into detail about the affair, because you probably know more about it than I do (the April mailing which you may have received by the time you're reading this was written more than a month after these notes were!) I hope to see many of you there.

One classmate we expect to find at the reunion is *Larry Turner*, who writes from Canada to make certain that he's on the mailing list. He and Bette now have two boys, one a baby who is currently occupying most of their time. Larry is working for Hiram Walker & Sons in Windsor, building a large distillery. He adds, "Not much of a change from Carling Breweries on the West Coast—Black Label to Canadian Club!"

With a wee bit of embarrassment about missing the March notes, your secretary acknowledges a letter from *Harold Laeger*, who begins: "It's been good to see your class notes in the last couple of issues of *Tech Review*. It's the first thing I turn to, and it's refreshing not to hit a big empty space between '58 and '60." He goes on to say that he's been working for the last six years in the area of magazine advertising sales promotion. He has worked for a number of publishers during that time, and just recently started with Dow Jones & Co., as assistant to the promotion director. In that capacity, Hal will be responsible for the promotion of

the *Wall Street Journal*, *The National Observer*, and *Barron's*. There will be about ten people reporting to him—artists, copywriters, research people, and so on. On the personal front, he and his wife have a ten-month-old son. The latter prompted Hal last year to give up city living and to buy a home in Englewood, N.J.

Phil Beach sends his regards from Caracas, Venezuela, where he is in charge of new plant construction and product development for IBEC. He and his wife sailed their 32-foot sloop across the Caribbean last December to the Virgin Islands, then back by way of the Lesser Antilles. . . . Enjoying sports also, but in a different clime, is *Bob Polutchko* who says that the skiing is great in the high country near his home in Littleton, Colo. The Polutchkos are expecting their fourth child next month, and Bob was recently promoted to Aero/Thermo Chief, Planetary Systems at his company (but I'll be darned if I know which one.)

Louis Nelson is a resident in neurosurgery at the University of California Medical Center in San Francisco. . . . *Barrie Shabel* received his Ph.D. in solid state science from Syracuse in 1966, and since then has been at the Alcoa Research Lab in New Kensington, Pa. . . . *Marvin Manheim* has been promoted to Associate Professor of Civil Engineering at the Institute. . . . *Robert Wagner* earned his Ph.D. in physics from Brown University in 1967, and is presently an Assistant Professor of Physics at Wesleyan University. . . . *Jeremy Glass* is on the staff of Sylvania's Applied Research Lab in Waltham, Mass., is married, and has two children. . . . *Charles Roden* is Head of Digital Transmission Systems, Physical Design Dept., at Bell Telephone Laboratories in Holmdel, N.J. . . . Apologies go to *Hank Siltanen* for the error in December notes; Hank is Supervisor, Information Services, for Kaiser Foundation Medical Care Program in Oakland, Calif.

As a final note this month, a man-on-the-move is *Walter Humann*. Walt has been elected Corporate Secretary and Assistant Treasurer of LTV Aerospace Corp., and has been appointed by the President of the United States as a Commissioner on the President's Commission on White House Fellows.—*Glenn Zeiders*, Secretary, Avco-Everett Research Lab, 2385 Revere Beach Parkway, Everett, Mass. 02149

60

Al Shalleck has joined Leasco Data Processing Equipment Corporation as Director of Business Planning after two years of consulting with the Diebold Group in New York. And speaking of consulting, *Bill Larrabee* is a Managing Associate of Ted Barry and Associates. . . . *Lawrence Kravitz* "married the former Miss Yvette Paura Counts of Aberdeen, Maryland. Promoted to Major and assigned to U.S. Army Weapons Command, Rock Island

Arsenal (Ill.), I am involved with developing air defense gun systems. My wife and I are looking forward to the travel around the country which this job will mean."

Ed Neild moved to Chicago from Dallas in the summer of 1968 to assume responsibilities as Partner in Charge of the Central Region for Eastman Dillon Union Securities. . . . **George Walsh** has been named Manager of Ocean Systems Engineering for the Raytheon Submarine Signal Division at Portsmouth, R.I. George is finishing his Ph.D. thesis with the University of Rhode Island. . . . **Morris Salame** is a Research Specialist (polymers) at Monsanto Packaging Division Research Center in Hartford, Conn. He is working on the development of new polymers for the packaging industry. . . . **Bob McCullough** received his Ph.D. in electrical engineering from Stanford in January, 1968. He, his wife Ginger and daughter Virginia now live in Milpitas, Calif. Bob is Manager of Systems Engineering at Peripheral Systems Corp., in Sunnyvale, Calif. . . . **Bob Mullen** writes: "We have adopted a fourth child, Steven John. I am now a full-time graduate student at the University of Iowa working for a doctorate in business. Received an M.B.A. from the University of Iowa in June. Started a leave of absence from Collins Radio Company in September."

Walter Crewson moved to LaJolla in August 1968 to become Projects Office Manager in the Science and Technology Division of Maxwell Laboratories—a San Diego firm engaged in high-voltage pulse systems production and Research and Development. . . . **Mike Rosner** says: "I am now a medical resident at Yale-New Haven Hospital. This past July I was discharged from the Navy after two years of duty in San Diego, Calif. Joan and I now have two boys—Jordan 4 and Douglas 2." . . . **Brian O'Connor** recently transferred from the DuPont Co., Central Research Department to their Organic Chemicals Department where he is a Research Supervisor in the Dyes Division.

Stephen Goodman is at Carnegie-Mellon University Graduate School of Metallurgy and Material Science; he is on leave of absence from E.C. Bain Laboratory for Fundamental Research, U.S. Steel. . . . **Mark Porter** is an investment broker as well as a chemical engineer; he works part-time with Newton Investment Company as a specialist in mutual funds.

Chris and I are on our way west—temporarily at least. In one of the more complicated logistical moves of the week, Chris left this afternoon with the children to drop them off with grandparents in New York. He'll be lecturing in New York City in the morning, and I'll be flying to Chicago to join him there tomorrow night. After a day of teaching in Chicago, we're going on to San Francisco—assuming all connections etc., work out. By the way, if any of you would like to phone in your class notes in French, please feel free. I'm taking a Berlitz crash course in

French, getting ready for a Harvard Business School-inspired trip to the north of Quebec—a case-writing assignment, and in a place where French is the preferred language. Watch this column for a report on that trip. Chris is headed for a three-day trip to Paris at about the same time that I'll be headed for a spot some 200 miles north of Montreal. Somehow or other, in spite of the fact that French is spoken in both places, I doubt that the two towns will swing the same way. . . . Send your life and hard times (in either English or French, but if it's in French please be very careful about your handwriting) to—**Linda G. Sprague**, Secretary, 10 Acorn Street, Cambridge, Mass. 02139

62

Philip F. Huddock reported to us in October, 1968 that he (XVI: LL.B, B.B.: L.L.M. Georgetown) and his brother Bob, '60 (XVI: S.B., S.M., E.A.A.: J.D. Georgetown) have opened a law office in Arlington, Va. Phil was associated with a Washington firm and will still maintain a D.C. office. Their practice will specialize in the Federal problems of transportation, government contracts, and anti-trust. Phil and Bob plan to view each problem area as a total technolegal system by utilizing a methodology developed during their association with The MITRE Corporation. Congratulations and our apologies for the late inclusion of this word from Phil. . . . **Hunter Jones**, employed by Price-Waterhouse in Seattle, was at the M.I.T. Club meeting this past week and I enjoyed a short visit. . . . **Kendall Company** (Boston), a health care and textile product company, recently named **Ross Whitman** a vice president.

Device to aid heart victims

A recent symposium sponsored by the University of Chicago on "heart transplantation, artificial heart and circulatory assists" featured an inflatable aortic balloon, developed by John Hopkins University under bioengineer **Bruce Gregg Brown**, which might save many "critical" heart attack victims, and which, after three years of research, surgeons anticipate using with patients in the near future. The balloon reduces normal aortic pressure and allows the heart to pump blood more easily when collapsed, and gives the blood an added push out to the connecting coronary arteries and capillaries when it is inflated. It is a cigar-shaped balloon, threaded by a catheter through the femoral artery to the aorta, and promotes blood circulation when the heart is in severe failure.

Interesting and scientific reading of a technical nature is contained in *A Manual Method for Space Rendezvous Navigation and Guidance*, co-authored by **John E. Prussing**, Research Engineer, University of California, at San Diego, La Jolla, Calif., for those interested in guidance of spacecraft by manual methods. . . . **Monsanto Company** announces the appointment of **Howard L. Minckler**, as general manager of their Organic Di-

vision. Formerly assistant general manager of the Organic Chemicals Division, he has also served in various research and manufacturing capacities with the former Plastics Division and in the Organic Division. . . . **Richard A. Crowell** has been elected a Vice President of the Boston Company, Inc.

Juan J. Calvo is now Branch Manager, Government, with I.B.M. World Trade Corporation in Caracas, Venezuela. . . . **Leland Jackson** was married on September 29, 1968, to the former **Diana Norton** of Atlanta, Ga., and they are now living in North Plainfield, N.J., where he is with Bell Telephone Labs and reports that he hopes to finish his Sc.D. degree in E.E. at Stevens Tech in June, 1969. . . . **T. J. Kohler**, now residing in Sheboygan, Wisc., has three daughters and is Executive Vice President of the Vollrath Company. . . . **Vincent Giambalvo** has been appointed to the University of Connecticut faculty as a new assistant professor after formerly teaching at the University of Heidelberg, Germany.

Vic and Lea Schneider announced the arrival of their first son, Benjamin, on November 11, 1968. He weighed in at 7 lbs. 7 oz., and was 21½ inches long. Congratulations to all three. . . . **S. J. Warner** is now working for the Executive Office of the President on long range fiscal resource planning, and announces that he and his wife 'expect' their first daughter in March (hope they let us know how their "expectations" turned out since this is submitted prior to March).

Robert E. Wilhelm writes that he has attended several meetings of the Bogota M.I.T. Club and there are quite a few M.I.T. alumni there with good positions in government or business. He also reports that five weeks spent in Europe (Denmark, Germany, Austria, the Netherlands, and England) was a great success.

Murray B. Sachs was married July 5, 1968 to the former **Merle Diener**, and presently is N.S.F. Post Doctoral Fellow at Cambridge University. Our congratulations to the Sachs. . . . **Daniel E. Thornhill**, who was working for M.I.T. Electronics Systems Lab in Computer Aided Design, reports on fellow classmate **John Stanley**, who married **Ruth Lleinheksel** on December 27, and will travel this March to Shahjahanpur, India to teach electronics in the Methodist Technical School. Daniel is organist and minister of music at Immanuel Baptist Church in Cambridge. . . . **Harold M. Waller** received his Ph.D. in political science from Georgetown University in June, 1968. . . . **Edward M. Schneider** writes that he is now Marketing Coordinator for Goodyear Chemical Division, and will receive his M.B.A. from the State University at Buffalo in June. He, his wife, Alice, and their first child, Lynn Stacy, born April 2, 1968, reside in Buffalo.

Earl R. Ruiter was promoted to Research Association in the Civil Engineering Department of M.I.T. and is working on Transportation planning for the Northeast

Corridor. . . *Robert A. Lytle* is now Assistant to the President at The Wickman Corporation in Detroit Machine Tools. . . *George W. Hippisley, Jr.*, who left the Boston area in mid-1967 after 4 years at Honeywell and one year at WBZ-TV, is now Manager, Circuit and Logic Design, Crouse-Hinds Co., Syracuse, N.Y., makers of traffic control equipment. . . Belated news comes to us of *John G. Whitman, Jr.*, and wife welcoming their first child, John G. Whitman III, on May 14, 1968.—*Gerald L. Katell*, Secretary, 310 Hoge Building, Seattle, Wash. 98104

63

This month will begin with news. There is a great backlog, so the emphasis will be on communicating the maximum amount of information in the least space. This is not the format I prefer, but it will be used for at least the next issue or so. Much of the information below is several months old and may now be outdated. Thus, you, we hope, will update us as soon as possible. My poor performance in getting news into *Review* is a source of shame for me, and I would like to publicly pledge great improvement. With that said, let's move on to the news.

First, a brief note of great interest, *Edwin Aldrin* writes that he was backup module pilot for Apollo 8 and will be prime crew for Apollo 11, the lunar landing. Ed received his Course XVI Ph.D. in 1963. You all, I am sure, join me in wishing Ed well. . . *Peter Anderson* writes that he is a project engineer at Carson Labs in Bristol, Conn., and is living in Southington. . . *Kenneth Andersen* is a sales engineer for Industrial Neuleonics Corp., in the Baltimore, Md., area.

Malcolm Beaverstock received his Ph.D. from Cornell and is working for UniRoyal Chemical in Naugatuck, Conn. . . *Laurence Beckreck* is completing his Ph.D. in Civil Engineering at Tech and is among the founders of a consulting firm. . . *Michael Bertin* received his Ph.D. from Rutgers in Physics and is currently a research associate at Stanford. . . *Steven Bernstein* is involved with satellite communications at M.I.T. Lincoln Labs and is living in Lexington. . . *Elliot Bird* is studying for his Ph.D. in math at Adelphi University on Long Island.

Ira Blumenthal has returned to the Boston area after a couple of years at Boeing in Seattle. . . *Thomas Bogan* married Elizabeth Chapin (Wellesley, '66) and is working for TWA in New York City as a Cargo Systems Project Engineer. . . *Woody Bowman* completed his Ph.D. in economics and is employed by the Federal Reserve in Chicago as a research economist in urban economics. . . *John Brach* reported that he is now married, is living in Cambridge and working for the M.B.T.A. (formally the M.T.A.).

Arnold Chalfant has completed his Air Force tour and hopes to continue his Ph.D. work at the University of Michigan.

James Champy graduated from Boston University Law School and is working for Champy Construction Company in Lawrence, Mass. . . *Allen Clark* is completing work on his Ph.D. in Food Science and will be working for the Coca-Cola Research Division. . . *John Clark* is moving to an operation weather central supporting Air Force activities in central Europe. John is now a Lieutenant Colonel.

David Claypool received his M.S. in Ch.E. from Rice. He is now a business analyst with the Diamond Shamrock Corp. . . *Steve Colburn* is married and is completing his Ph.D. in Communications Biophysics at Tech. . . *Arthur Connolly* is with Lockheed Aircraft and has moved to Burbank. He received an M.S. in Aerospace Engineering from U.S.C. . . *Sandra (Lensch) Cunningham* lives in Stamford, Conn., and is employed as a math analyst at Refectone, Inc. Sandra was voted the Outstanding Woman Engineer of 1968 by the Connecticut Society of Women Engineers.

Shoel Cohen is working on his Ph.D. in psychology at State University of New York at Stony Brook. . . *Thomas Cook* is studying for his M.B.A. at the University of North Carolina at Chapel Hill. . . *Frederick Cunningham* is Chief Engineer and Vice President of Cunningham Industries Stamford, Conn. . . *Richard Dougall* was promoted to Associate Professor of Mechanical Engineering in September, 1968. . . *Herbert Doepken* received a Ph.D. in E.E. from M.I.T. and is now working at High Voltage Power Corp. in Burlington, Mass.

Edward Dudewicz is at the University of Rochester. . . *Bruce Eisenstein* is an instructor at Drexel while completing his Ph.D. at the University of Pennsylvania. His wife Toby will receive her Ph.D. from Bryn Mawr next June. . . *Ronald Englade* is completing his Ph.D. in space physics at the University of Chicago.

Mark Epstein was awarded a Ph.D. in E.E. by Stanford and is presently employed by Page Communications in Washington. He lives in Bethesda. . . *Lawrence C. Erdmann* received an S.M. in physics from Yale and an S.M. from the Sloan School. He recently started his own investment firm in New York. . . *Jim Evans* is on the research staff at Lincoln Labs and living in Newtonville. . . *Jim Fidelholtz* was awarded a Ph.D. in Linguistics and is a First Lieutenant in Military Intelligence at NSA, Fort Meade. . . *Marshall Flam* has completed his Internship at Bellevue Hospital in New York City and is now working on his Residency there.

That is all for this month. I would like to mention that I belong to the Class Activities Committee of the Alumni Association. We are studying the range of class activities and are more than open to suggestions and criticisms. If you have either please pass them on to me. Perhaps those of you who have studied or now teach at other universities have en-

countered ideas that appeal to you.—*Martin Schrage*, Secretary, Box 302, Kenmore Station, Boston, Mass. 02155

64

The Class Hero this month is *Chuck Counselman*, who wrote to say that he has received his Ph.D. from M.I.T. and is now an assistant professor in the Department of Geology and Geophysics. He expects to be in Puerto Rico in June to observe the occultation of the Crab Nebula. . . *Mark Ain* called *Bill Rentz* in the middle of the night to report that he is now engaged, and is planning a spring wedding. Bill, meanwhile, is still enjoying bachelorhood and is an instructor in the Business School at Northwestern. He is also finishing up his dissertation in economics at the University of Rochester.

Wesley Akutagawa is working on his Doctor of Philosophy at Harvard in solid state physics. . . *Paul Berger* was married last September to Susan Moore of Newton, Mass. . . Captain *Robert Campbell* was awarded the Army Commendation Medal for meritorious service during his tour as 1st Region guided missile staff officer from 1966 through 1968. He devised a new system of analyzing equipment statistical reports that has been of considerable benefit to the Army.

Richard Cease is a group leader in the radio relay department at Raytheon. A few months ago he presented a paper at an engineering meeting concerning a signal processor for an adaptive antenna array. . . *Ernest Henrichon* received his Ph.D. in E.E. at Purdue and has now joined the technical staff of Information Research Associates in Waltham, Mass., as a Project Scientist. . . *Lawrence Kaldeck* is working as a programmer for the Scientific Computation Center at Itek Corp., in Lexington, Mass.

Richard Kline writes that he is still a student and is happy to see M.I.T.'s continued interest in the fraternity system. . . *Harry Kurtzig* was married in December to Miss Sandra Lynn Brody of Beverly Hills, Calif. Harry received his Ph.D. from Stanford and Sandra obtained both her M.S. and Mrs. degrees there. They are now living in Short Hills, N.J. . . *John Liu* received his Ph.D. in physics at Princeton, where he is currently a research associate. . . *T. A. Marnane* is the superintendent of the Design Division at Charleston Naval Shipyard, where he overhauls everything from wooden minesweepers to Polaris subs. . . *Wayne Matson* recently presented a paper at a meeting of the American Chemical Society concerning the effect of air and water on metallic air pollutants.

Stephen Meyer is presently the project coordinator for Campus Crusade for Christ. . . *James Monk* was drafted in September of 1967. After nine months in Virginia, he is now serving in Germany. . . *David Morrison* received his M.S. from the University of Massachusetts,

and is now working on ordnance systems for G.E. He is taking night courses at R.P.I. in Troy, N.Y. . . . *John Nagle* received his Ph.D. at Harvard last year. He is now an assistant professor at Syracuse University. . . . *Mark Ordower* has petitioned the Alumni Office for inclusion on Class of 64 mailings. . . . *J. Parchesky* is a project engineer at Discon Corp., in Ft. Lauderdale. He is married to the former Carol Anne Roby, and they have one daughter. John also teaches part-time at a local junior college, in addition to working on his M.S. at the University of Florida. . . . *Leonard Parsons* is now an assistant professor of marketing at Indiana University, after receiving his Ph.D. at Purdue. Len was given an award for his dissertation by the American Marketing Assn. His daughter Lori is approaching two years of age. REMEMBER THE REUNION, and let me hear from you. —*Ron Gilman*, Secretary, 1021 Oakmont Pl. Apt. 8, Memphis, Tenn. 38107

65

Dave Rubin spent last summer touring Europe with his wife, the former Miss Sharon Goldman. Dave is working as transportation planner for the Twin Cities Metropolitan Council in St. Paul. . . . *Anthony Layton* is now a captain in the Army Ordnance Corps working in the Ballistic Research Labs on the Aberdeen Proving Grounds. . . . *Bruce Bottomley* reports his release from active Army duty (most of the tour done in Germany) and his recent marriage to the former Miss Sue Anne Lapierre. Both are now grad students at Washington State University. *Ed Strauss* is finishing up his master's at the Sloan School and is currently living in New York City working as a Financial Systems Analyst for Mobil Oil.

Jerry Saxon is in the doctoral program in physics at the University of Chicago. . . . *Jim MacMillan* is finishing up this year at Case Western Reserve medical school and reports that in October, 1967 he married the former Miss Sue Anne Larson. . . . *Christian Kim* reports that since leaving M.I.T. he's been working with Electro-Watt Engineering Services Ltd. in Zurich. Chris will be returning to the U.S. to be married to Miss Susanne Baumann and to move to a new job in Denver. . . . The *John Holdrens* are expecting their second child while John is finishing up his Ph.D. work in plasma physics at Stanford and is also working with Stanford's Population Biology Group on the technical implications of the population explosion (how's that again?).

Gerald Roskes is continuing his graduate work in mathematics at Tech. . . . *Chuck Seniawski* has been promoted to Captain and is in charge of all planning and scheduling at the Minuteman Missile complex at Malmstrom AFB, Montana.

Pierre Perrolle reports a new daughter, Jeanette. Pierre is finishing up his Ph.D. work in Chinese Studies at Brown and is hoping to do field research in Hong Kong next year. . . . *Tom Perrone* received the

Air Force distinctive service award for his work as weather officer at Stewart AFB, N.Y. . . . *George Borton* has been promoted to assistant superintendent at Dow Chemical's Methylcellulose plant in Midland. . . . *George McQuilken* is living in Somerville with his wife and two daughters and is now a Systems Engineer for IBM.

Captain *Jerry Robertson* sends greetings from DaNang where he is the Executive Officer of Communications Support Company, 7th Communication Battalion, 1st Marine Division. . . . *Martin Graham* is in the graduate program in nuclear physics at the University of Mass. He married the former Miss Carol Ann Zmada, an education graduate of the University of Massachusetts. . . . *Jim Sprinkle* married the former Miss Gloria Klizicki in Chicago and is now completing his Ph.D. in geology at Harvard. . . . *Dave Curtis* is working in reactor metallurgy research on the Navy/AEC staff of Admiral Rickover.

Lieutenant *Bill Cohen* is serving aboard the U.S.S. Constellation and is returning to San Diego after an eight-month deployment in the Gulf of Tonkin. This March he will marry Miss Barb Lee Cohen. . . . *J. D. Roach* reports his marriage to the former Miss Pamela Jane Flebbe of Omaha, Neb. who he met at Stanford. J.D. is currently the Administrator of Information Technology at the Northrup-Ventura Division in Los Angeles.

Charles McBride is doing research in military logistics at the Institute for Defense Analysis. . . . *Steve Loutrel* married Miss Elizabeth Deane in June, 1966 and is currently working on his Ph.D. in mechanical engineering at M.I.T.

Charles Gholz passed the New York bar exam last July and will start law practice upon release from the Army Signal Corps. . . . *Martin Goldsmith* married the former Miss Karen Stockman of Milton in April and is now a 4th year medical student at Tufts specializing in radiology.

Sharon Ross is now working on a doctorate in math at Emory after teaching for two years. . . . *George Hadley* and *George Moyer* climbed Mt. Rainier last summer. . . . *Steve Rosenberg* is assistant to the Superintendent of the Boston Police Department and is on the Board of Directors of the Municipal Police Science Institute. . . . *Dick Ayers* has been recently selected Secretary of the M.I.T. Alumni Club of Central Massachusetts. —*Jim Wolf*, Secretary, Apt. 1114, 24455 Lake Shore Blvd., Euclid, Ohio 44123

67

I recently began working in Ouaouiyaht, a Berber village tucked away in the Middle Atlas Mountains of Morocco. Just beautiful! Our jeep takes us most of the way to the work site, but we must use a donkey to carry our equipment the last mile. During the evenings I keep busy teaching English and taking Karate lessons.

Richard Clymer is a grad student in the U.C.L.A. geology department. . . . *Harvey Golomb* is in his second year at the Harvard Business School. . . . *Art Warshaw* married Christine Michaels, Boston University '68, last September and now has a management position with Standard Tool and Die Company in Los Angeles. . . . *Kwong Chu* is working for his doctorate in astronomy at Caltech.

Having received his M.S. in structures from the University of Illinois last August, *Andy Mera* is with Boeing in Seattle. . . . *Richard Pikul* is an instructor in civil engineering at Union College and is beginning work toward a doctoral degree. . . . *Sandra Foote Snow* is a staff scientist at Tyco Laboratories, Inc., in Waltham, having received her S.M. from M.I.T. in September. . . . *Larry Hall* is with the U.S. Coast and Geodetic Survey in Norfolk.

Tom Miller writes that he spent an eventful summer working for the Big Uncle at the U.S. Naval Ordnance Laboratory in Silver Spring, Md., and that he is back at Harvard completing work on his masters degree in acoustics for the Division of Engineering and Applied Physics. . . . *Paul Goldstein*, a second-year student at the Washington University School of Medicine, received an award recognizing his high general standard. He will receive the Doctor of Medicine degree upon completion of his four-year program. . . . *Bob Curtis* has been commissioned a second lieutenant in the U.S. Air Force upon graduation from Officer Training School at Lackland AFB, Texas. He has been assigned to Headquarters Command, Washington, D.C. . . . *Larry Taggart* married Marjorie Rodda of Syracuse, N.Y., October 26, and is a production engineer at Procter and Gamble's Chicago plant. He is also attending the University of Chicago night school and will receive his M.B.A. this spring. . . . A newspaper clipping brings news that *Adam Clayton Powell III*, son of the New York congressman, and Miss Beryl Slocum of New York and Newport are considering marriage. Miss Slocum was Newport's number one debutante of the 1960 season, and her great-grandparents were members of New York's original "400" social leaders.

Richard Chappell is teaching math in a small high school in Blythewood, S.C., near Columbia where he lives. This occupation gives him a welcomed II-A draft classification.

Top dog

Roger Kirst is still leading the pack at the Stanford Law School. . . . *Jeff Dodson* is in the Harvard M.A.T. program after completing one year of graduate work in Physics at M.I.T. last year. He is preparing to teach high school near Boston next year, and he is planning to teach in San Francisco the following year.

Gary Garmon is working as treasurer in Kansas City for Black Light, Inc., a small company that was formed by one of his friends from the Harvard Business

School. The company creates Black cartoons for television and newspapers and is also involved in developing a large block of land in a ghetto. Of fifteen employees, twelve are Black.

Deceased

I am sorry to report that *Akos Deyso Szekely*, S.M., died in Vietnam on October 1, 1968. He was born in 1942, received his B.S. from the U.S. Military Academy, and his S.M. in mechanical engineering from M.I.T. in 1967. I believe he was a Captain at the time of his death, but I do not have any further information.

An abundance of brass rats

Last June *Bob Karz* received his M.S. from the University of Illinois where he is now a Ph.D. candidate in metallurgy. Having recently become engaged to *Myrna Bentkover* of Chicago, he will be married in August. Bob writes that "Brass Rats" abound in the office he shares with five others. Three of the six are from M.I.T., the other two being *Bob Large*, '66, and *Bob Shull*, '68. . . . *Jeffrey Waldman*, Sc.D., is a research metallurgist at Frankfort Arsenal in Philadelphia. . . . *Andrew Goldsmith* has joined Rohm and Haas Company's Engineering Division at Briston, Pa., where he is developing computer programs to perform mathematical studies of chemical plant design and operation. He received his M.S. in 1968.

While I was writing these notes a postman delivered (finally) a formidable looking package of clippings and letters that had been mailed November 15. Since another month's dust won't hurt this old news, and since I already have enough news for a healthy column, much of this recently received material will have to wait. Don't take this as a hint not to write. . . . I can always use new material.

Cogitate

John Shufelt is the Vice President of a data processing firm called "Cogitate." He formed the company with the aid of a friend, *James Harlan*, who is a graduate of Michigan State and President of the firm. Cogitate is located in Southfield, Mich., and has six employees in addition to the owners. Having grossed \$130,000 and made a little profit last year, Shufelt and Harlan have ordered a larger computer and are looking around for new business.

Their principal account is *Diners-Fugazy Travel* for whom they have created unusual things, including a national poker game. Cogitate is presently working on a plan to computerize voting that uses voice identification imprints and voting by telephone.

A few quickies

Anthony Cwiertny is employed by *McConnell Douglas Corporation* in Santa Monica, Calif., as an engineer-scientist in the advanced structures research branch. . . . *Mark Grossman* is teaching and studying physics at *Rutgers University*. . . . *John Mauer* is a Yale graduate

student. . . . *Paul Scheffler* is a graduate research assistant in physics at Caltech. *Peter Wolfe* writes that he is keeping out of drafts. . . . *Joe Sansone* is now at U.R.I. . . . *Mike Schiff* is in his second year at Sloan. . . . *George Starkschall*, while still active in the M.I.T. Gilbert and Sullivan Society, is working towards his Ph.D. in chemical physics at Harvard. *Steve Slater* received his chemical engineering S.M. last September. . . . *Jim Gips*, who lived quite near me last year at Stanford, is working at the National Institute of Health, Bethesda, Md. He has received his M.S. in computer science and a commission in the Public Health Service.—*Jim Swanson*, Secretary, Services Provinciaux, Beni-Mellal, Morocco.

68

Today was supposed to have been registration day for the "Spring" term. It wasn't. It seems the whole Northeast was buried under feet of the white stuff. Accordingly Technology ground to a total halt on February 10 and stopped at 3 p.m. on the 11th. While this postponed Registration Day and the Course VI preliminary exam (qualifier) I was supposed to take, it did give me time to try my hand again at the class notes.

First, in the tradition set by my wife in past months, we shall have the social notes. *Jerry Grochow* and *Louis Barnett*, '71, plan to be married in September. Jerry, our class agent, is working as a DSR at Project MAC and is a special student. By my count he will become the eighth member of the class to marry a coed, welcome to the club! . . . *Harvey Newman* will be married to *Lynda Horowitz* of Brookline on August 23. Harvey is a graduate student in Course VIII and Lynda plans to teach speech therapy in the Boston area next year.

On June 8, 1968, *Cary Bullock* married the former *Marian Dean* of New York. Cary is now working for Sylvania in Cambridge. . . . *John Vitek* was wed to the former *Martha Lovering* in June. They moved to California in September where John is currently going for a master's in material science at Caltech. . . . Finally, *Thomas Laffler* married the former *Delfina Burns* on September 14 and is now at the University of Washington studying genetics.

Drafted

I reported sometime ago that I knew of no one in our class who had been drafted. *Doug Wilson* would like to claim this first. He was ordered to report for induction on February 6, 1969. Prior to that date he had been attending the University of Colorado Graduate School in physics. I have three other pieces of military news this month. Ensign *Jay Sinnett* entered the Navy on June 25 with his R.O.T.C. commission. After 13 weeks of electronics schools he was assigned as an Electronics Division Officer on the supercarrier *Saratoga* (CVA-60) which just left a year-long overhaul and will be

undergoing refresher training until June deployment. Second Lieutenant *Martin Brack* reported to active duty in the Army on January 8 having received his R.O.T.C. commission in September. *John McFarren* enters Air Force OTS on April 7.

A.E.C. Fellowships

This year the A.E.C. awarded 81 Special Fellowships in Nuclear Science and Engineering. Three of these went to members of our class. They are: *Bob McCrory*, who is in Course XXII now, *Frank Feinberg*, who is staying in Course VIII, and *Stan Humphries*, who is now at Berkeley.

In brief

Larry Daddario is at Stanford working on and M.S. in E.E. which he expects in June. If all goes well he hopes to stay around and work on a Ph.D. . . . *Robert Anthonyson* is also at Stanford where he is working on an M.B.A. in the Graduate School of Business. . . . I previously reported that *Howie Ostroff* was at Northwestern. Since then he has written that he is working on a master's in transportation engineering and, in order to do some "practical transportation engineering," he has a part time job driving a cab in Evanston. . . . *Paul Gluck* is now at the N.Y.U. School of Medicine and *John Niles* is working on an M.S. in industrial administration at Carnegie-Mellon. . . . Of course, there are a few people still around M.I.T. *James Just* writes that he is back in Course VI working in OR. *Vahe Davidkhanian* is still here but he is planning to go to the Imperial College of Science and Technology (University of London) next September for a Ph.D. in Mechanical Engineering.

Jeff Silverman is a registered representative for *Walston & Co.*, members of the N.Y.S.E., and is specializing in commodity speculation and international arbitrage in Boston. . . . *Bob Young* reports that he gave up his training in the life sciences to become a photographer. He is now the Microcirculation Photographer/Senior Research Assistant at the Peter Bent Brigham Hospital.

I have some news about people who received only graduate degrees with our class. First Lieutenant *Robert Yingling* is now stationed at *Wright-Patterson AFB* as an electronics engineer. . . . *James Kempner* is working at the Synthetic Fiber Spinning Laboratory of Rohm and Haas in Philadelphia. . . . *Antonio Marquez* is with *Humble Oil & Refining's* Baytown Refinery near Houston. . . . And finally *Dr. Alan Levi* reports that he is continuing his research at the Department of Chemistry, University of California at San Diego.

That about all I have for this month. Remember, if you would like to see an interesting column every month, help us out by dropping us a note occasionally about what you're doing—*Gail* and *Mike Marcus*, Eastgate-Apt. 4H, 60 Wadsworth St., Cambridge, Mass. 02139

Course Review

Copy for this issue of *Technology Review* was due from your Secretary about February 20. Information reaching him after that date will be reported in the May issue.

V

Edward R. Kane, S.B., Union College 1940, was awarded the doctorate in physical chemistry, M.I.T. in 1943. In his last year of graduate study he served as an instructor in 5.01 and 5.02—teaching two sections—recitation and laboratory at the then established rate of \$1,800 for nine months and tuition of \$200 for the same period. "Jack" Reynard, scouting for research material for the DuPont Company convinced Ed he should join DuPont as a research chemist in the Nylon Section of the Experimental Station at Wilmington.

A clipping from the *Evening Journal*, Wilmington, sent to your correspondent and received on January 25 announced: "Edward R. Kane, General Manager of the DuPont Company's Industrial and Biochemicals Department was today named a Vice President, Director and Member of the Executive Committee, effective February 1." Ed moved around in his 25 years service; in 1949 to the Seaford, Del., Nylon Plant; in 1950 to the Chattanooga, Tenn., Nylon Plant; in 1954 to the Kingston, N.C. Research Laboratory for Dacron and in 1955 to Wilmington on special assignment. In 1959 he was named Plants Technical Manager; in 1959 Director of the Nylon Technical Division; in 1964 Assistant General Director of the Technical Division of the Textile Fibers Department; in 1966 Assistant General Manager of the Industrial and Biochemicals Department and in 1967 General Manager of that department. Dr. Kane's research program was directed by Professor James A. Beattie, Emeritus, but still active in the Department of Chemistry.

Stanley Bloom, S.B., V 1953, Ph.D. Harvard 1956, joined Polaroid after a career as a teacher and as a research worker with Dr. Elkan Blout at the Children's Cancer Research Foundation in Boston. He has been appointed Manager of the Organic Research Laboratory at Polaroid. . . . *Milton Green*, S.B. V 1940; Ph.D. Columbia 1951, served in the U.S. Marine Corps from June 1944 to August 1946 and has since been with Polaroid. He has been named assistant

director of research. . . . In December 1967 *John E. Wood, III*, A.B., Lynchburg College, Va., Ph.D. in organic chemistry M.I.T. 1939, authorized the publication of the following in the "Class Activities" in a future issue of *Technology Review*. Perhaps his memo stimulated the inclusion of Course Notes V which started shortly thereafter.

"I have completed almost three years as Executive Vice President of Vulcan Materials Company in Birmingham, Ala. The opportunity to repatriate in the South was too much to resist—hence my resignation as President of Enjay Chemical Company in New York in February 1965. We have one son who is a Lieutenant, U.S. Navy Air Corps and stationed in Jacksonville, Fla.; a second boy who is a chemical engineer (Vanderbilt '66) with West Virginia Pulp and Paper Company in Covington, Va.; our daughter is a sophomore at Wellesley."

A second letter dated December 1968 (to the Alumni Fund Board) authorized possible use under "class activities" and I quote to bring you up to date. "Continuing as Executive Vice President of Vulcan Materials Company and President of its Chemicals Division; enjoying the many advantages of southern living as compared with 10 years in New York City. Oldest son is a career officer in the Navy Air Corps; second son in graduate school at the University of Virginia; daughter taking junior year abroad from Wellesley."

A memorandum from *Bruce M. Foxman*, B.S. Iowa State 1964; Ph.D. in inorganic chemistry June, 1968, will be of interest to all those who knew him on the top floor of Building 6 or as a tutor in Baker House. "I am a research fellow in inorganic chemistry at the Australian National University, Canberra, Australian Capital Territory, Australia, on a three-year appointment. I married Carole Witkopf (from Boston University) at Algona, Iowa, on September 14, 1968. We arrived in Canberra on November 6, 1968." His research program was directed by Professor F. A. Cotton.—*Leicester F. Hamilton*, Correspondent, M.I.T. 4-254, Cambridge 02139

VI

The Course VI alumni, elected Fellows of I.E.E.E. as of January 1, 1969, with fields of their citations, are as follows: *Richard C. Booton, Jr.*, Sc.D.'52, time-varying and nonlinear guidance and control systems; *David R. Brown*, S.M.'47, digital-computer components and the design and operation of large-scale information processing systems; *Albert E. Cookson*, S.M.'51, application of communication satellites to provide world-wide military communications; *Robert R. Everett*, S.M.'43, development of digital computers and of computer-based real-time control systems for continental air defense; *James L. Flanagan*, S.M.'50, Sc.D.'55, reduced-bandwidth speech communication systems and the fundamental understanding of human hearing; *Edward S. Halffmann*, VI-A S.B. and S.M.'36, control and instrumentation, and the application of analog and digital computers to the more efficient operation of electric power systems; *Norwood D. Kenney*, S.B.'30, the wire and cable field, particularly the development and application of solid dielectrics for high voltages; *Jerry B. Minter*, VI-A S.B.'34, radio signal generating and measuring devices; *Kerns H. Powers*, Sc.D.'56, new communication systems and concepts; *Walter Rotman*, S.B.'47, S.M.'48, antenna technology and the better understanding of the interaction of electromagnetic waves with plasmas; *Ned A. Spencer*, S.B.'46 technical and managerial leadership in the development of antennas for radar and communications; *Virginus N. Vaughan, Jr.*, VI-A S.B. and S.M.'37, data communications engineering including systems planning, project management, and standards activities; *Perry H. Ware*, VI-A S.B. and S.M.'35, solid dielectrics and ability to communicate knowledge of them to the industry; *Henry J. Zimmermann*, S.M.'42, educator and director of research and graduate training in the broad field of electronics.

Richard C. Booton, Jr., Sc.D.'52, is Electronic Information Systems Operation Manager in the Electronic Systems Division of TRW, Inc., Redondo Beach, Calif. His responsibilities include the

over-all technical and management direction of TRW's communications, data systems, and electronic warfare product lines. Joining TRW in 1957, he directed the trajectory and navigation analysis efforts for the Pioneer I, Explorer VI and Pioneer V spacecraft, and was responsible for the technical management of the design, development, and production of the communication equipment for the Orbiting Geophysical Observatory (OGO), the Vela satellite, the Pioneer spacecraft, the Space Ground Link Subsystem (SGLS), and the Relay satellite program. His election as a Fellow of I.E.E.E. is the second time Dr. Booton has been honored by this professional society; he received the Browder J. Thompson award in 1953. His undergraduate work in electrical engineering was done at Texas A and M University where he also received a Master's degree in mathematics.

Robert J. Dirkman, S.M.'60, Assistant Professor of Electrical Engineering at Merrimack College, North Andover, Mass., has been awarded a Science Faculty Fellowship by the National Science Foundation to study at the Harvard Graduate School of Engineering and Applied Physics. He has developed a new course, The Design of Engineering Systems, at Merrimack and is especially interested in the use of computers in teaching. His Harvard program will be directed along the lines of computers and systems.—Karl L. Wildes, Correspondent, Room 10-303A, M.I.T., Cambridge, Mass. 02139

XIII-A

Admiral Emory Land, S.M.'07, celebrated his 90th birthday on 9 January, 1969. The Chesapeake Section of The Society of Naval Architects and Marine Engineers devoted a major portion of its January meeting to a testimonial for Admiral Land. Mr. James J. Henry, President of SNAME, read the Society's testimonial for Admiral Land's many contributions. A substantial number of graduates of the Department of Naval Architecture and Marine Engineering were in the audience. Included were: *Ralph K. James, S.M.'33; Donald Holden, S.M.'31; Rear Admiral Douglas Henderson, USCG, S.M.'43; Hubert Reece, S.M.'41; Fred Munchmeyer, S.M.'48; Jacques Hadler, S.M.'47; Bob Stark, S.M.'48; Peter Pien, S.M.'48; Captain Richard Goode, USCG Nav. E.'52; Captain Parker Chapman, USCG, Nav. E.'51; Commander Virgil Rinehart, USCG Nav. E.'54; Pete Wood, Nav. E.'55; Dan Marangiello, Nav. E.'56; Commander Bob Stancliff, Nav. E.'56; Commander Edwin Parker, USCG, Nav. E.'61 and Roderick Edwards, Nav. E.'66.*

Rear Admiral R. B. Fulton, USN, S.M.'41, retired from the Navy in July 1968. He is currently Head of Engineering Technology at State Technical Institute, Memphis, Tenn. Commander David Flanagan, USCG, Nav. E.'62, left the Coast Guard Academy, where he was Chief of the Electrical Engineering

Section, last June. He is currently assigned as Project Officer for the Oceanographic Ship WHEO 701. *Jimmie James, S.M.'33, executive director of the Committee of American Steamship Lines, has resigned to set up his own marine consulting firm in Washington, D.C.—Robert E. Stark, Correspondent, M. Rosenblat & Son, 350 Broadway, New York City 10013*

XVI

Let's start off this month with news from some of our overseas alumni. *Zwi D. Choras, '33, was one of many Russians who came to this country for schooling in the 1920's and 1930's. After earning an M.E. at Cornell in 1932 he came to us and received his master's the following year. Evidently Zwi liked to traipse around the world, for he spent the next several years as a stress engineer with Fokker Aircraft of Australia. When the war came he went up to England and joined the British Army, "... driving a (?) and having a front-line view of things there—a good safe tour of Europe." (Wish I could read his handwriting!) It would be interesting to know what he drove in Europe during wartime that was so good and safe. At war's end he went to Israel, but since there were no aircraft jobs there he got into the building industry "... as practically anyone can find something to do without any training for the job." At last report he was living in the communal village of Yotvata with his wife, daughter-in-law, and her two girls. His office was in nearby Eilat at the head of the Gulf of Aqaba, a spot that became well known to us during that whirlwind war.*

From the other side of the world comes news from *Yukio Otsuki, '37, also in the building business but in a somewhat different capacity. Yukio lives in Kamakura, and he is Managing Director and Chief of the Technical Research Lab of the Shimizu Construction Co., in Tokyo. In recent years he has specialized in the field of building vibrations such as vibration hazards, aseismic design of building structures, and possible unstable vibrations of tall buildings during wind storms. Yukio had news of Hideo Tsukada, '35, to the effect that he retired from Showa Aircraft Co., in mid-1966, but knew nothing further.*

Another retiree, and one who has found himself a rather different occupation is *Edward A. Rodgers, '49. After 25 years in the Navy, Rear Admiral Rodgers resigned in 1964 to accept the position of Superintendent of the Maine Merchant Academy in Castine, Maine. "Now I seldom have a chance to think or work as an engineer, but find myself completely absorbed in the usual problems of college presidents. One of my present problems is to locate an Academic Dean." Hope he succeeded.*

Out in Weston, Ill., is a giant accelerator operated by a group known as the Universities Research Association, with a 15-man board of trustees in control. One of the 15, representing Northwestern,

University of Chicago, and University of Illinois, is *Lucius P. Gregg, '61. Here's what Northwestern said in announcing his appointment: "A graduate aerospace engineer from M.I.T. and a former research scientist with the U.S. Air Force Office of Scientific Research, Dean Gregg is also the first negro to be named to the Weston board to date. He was appointed a member of the board by the U.R.A.'s Council of Presidents, composed of the presidents of the 47 member universities in U.R.A. "Dean Gregg joined Northwestern's administrative staff in 1965 as research coordinator, and was named to the associate dean's post in 1966.*

He is also a faculty member of the Department of Mechanical Engineering and Aeronautical Sciences in Northwestern's Technological Institute. Dean Gregg was named the outstanding young engineer of 1964 in the Washington, D.C., metropolitan area by the Washington Academy of Sciences. Two years later the Chicago Junior Association of Commerce and Industry named him one of the Ten Outstanding Young Men of 1966. He received his bachelor's degree in electrical engineering from the U.S. Naval Academy in 1955 and his master's degree in aeronautics and astronautics from M.I.T. in 1961."

Vincent P. de Poix graduated from the Naval Academy in 1939 and two years later was ordered to Pensacola for flight training. Then followed some rather rugged action in the South Pacific with a fighter squadron based successively on the Enterprise, the Saratoga, and then Gaudalcanal. In 1944 he reported to the Postgraduate School and the following year came to Cambridge, earning his S.M. in 1946. From that time on he had a varied career—aviation fire control, command of a fighter squadron based on the east coast, aviation ordnance, guided missiles, commanding officer of a seaplane tender, and finally to the A.E.C.'s Division of Reactor Development for instruction. This last was in direct preparation for things to come. In 1960 the world's largest ship and the first nuclear powered aircraft carrier, the new U.S.S. Enterprise, was launched, and its commander was Vincent P. de Poix. Three years later he was ordered to the National War College then, after a tour in the Office of the Secretary of Defense, Rear Admiral de Poix took command of Carrier Division Seven in 1966 and headed for the Tonkin Gulf. "Here (I have) acted periodically as tactical commander for Navy attack aircraft carriers in strikes on North Vietnam," and his aide added "... in support of United States policy in Southeast Asia." Since then that policy has changed, and with it the Admiral's duties.

So much for now. Can hardly wait to see these notes in print, for that will mean this 2-foot-plus blanket of snow will only be a bad memory, and we'll be watching for crocuses and tulips to push through the ground. Happy spring to you!—Professor Walter Wrigley, Correspondent, IL3-419, M.I.T., Cambridge, Mass. 02139

Data General is mass-producing small computers, which puts our money where our mouth was.

We made three brash statements when we started out.

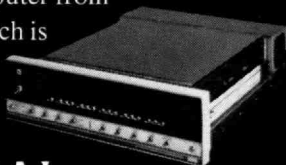
1. We said we had the best small computer in the world.
2. We said we were rich. 3. We said we'd produce computers in volume. Let's look at the record.

First, our NOVA has had a fantastic reception. Because it's the first small general purpose computer built around big computer architecture. It has multiple accumulator/index register organization and expandable read-only memory you can program like core.

Second, we've plowed our money into a new plant in Southboro, Mass. And we've developed a technical service organization big enough to support big numbers of users.

Third, we've got our production line rolling. Delivering ahead of schedule. It isn't surprising. Because we deliberately designed NOVA to be the easiest small computer in the world to make. No complicated back-wiring. It's MSI. This year we're making several hundred. Next year, over a thousand.

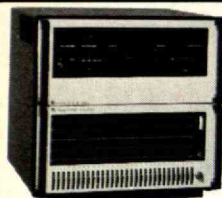
And that's just the beginning. Because we figure the only way you can get the price and support you want is to buy a mini computer from a guy who produces many. Which is why Data General is making such a big production of such a small computer.



 **DATA GENERAL
CORPORATION**
Southboro, Massachusetts 01772

Harvey P. Newquist, Director of Manufacturing

New Instrument Showcase



Real-Time Analyzer

The Type 1921 Real-Time Analyzer is a new generation analyzer. It performs real-time one-third octave spectrum analysis in the frequency range from 3.15 Hz to 80 kHz employing a unique digital detection scheme to achieve performance unattainable with analog techniques. The major components of the analyzer are the Type 1925 Multifilter and the Type 1926 Multichannel RMS Detector.

Sweep-Frequency Reflectometer



Reflectometry has been greatly simplified with GR's new 1641. It gives direct, precise readings of SWR and insertion loss (in dB) from 20 MHz to 7 GHz in two ranges in sweep- or single-frequency operation... residual SWR typically <1.02 ... direct reading in SWR and loss... all coaxial hardware internal... precalibrated, simplified operation... complete - add only source and scope.

Digital Voltmeter Calibrator



Calibrate your dc digital voltmeters quickly and easily with our highly stable 1822 calibrator... 100- μ V to 1111.1-V output... 10-ppm stability... mobile secondary standard... automatic stepping, programmable.

Counter



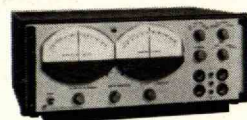
New 35-MHz IC counter-timer (the 1191-B) measures frequency, frequency ratio, time interval, period average, and period between successive pulses... 1- μ s minimum display time... frequency range extends to 500 MHz with GR scaler... 10-mV sensitivity (to 20 MHz)... optional high-precision time base and BCD data output.

Pulse Generator



The 1340 is the widest-range pulse generator in its price class, only \$395 in the USA. Extremely useful for testing IC's... 0.2 Hz to 20 MHz... 2.5 s to 25 ns duration... 5-ns rise time... 10-V output with ± 1 -V offset... amplitude, period, duration modulation.

Impedance Comparator



Versatile new 1654 Impedance Comparator with percent-deviation readout of magnitude and phase angle... 0.003% comparison accuracy... 100 Hz, 1, 10, and 100 kHz... wide impedance ranges. Addition of new 1782 Analog Limit Comparator increases measuring speed of 1654 up to 4 components per second, provides limit-control settings and display lights for manual sorting. Optional models operate automatic sorting devices.

Random-Noise Generator



GR's new random noise generator, the 1383, generates wide-band noise of uniform spectrum level... 20 Hz to 20 MHz, ± 1 dB... 30- μ V to 1-V output, open-circuit... 50-ohm output impedance... meter and 10-dB-per-step attenuator.

Megohmmeters



Introducing two new megohmmeters - both are direct-reading, safe, stable, and easy to operate. The 1863 is the choice for production and inspection uses... 5 test voltages: 50 to 500 V... 50 k Ω to 20 T Ω ($2 \times 10^{13}\Omega$). The more flexible 1864 is best for the laboratory... 200 test voltages: 10 to 1000 V... 50 k Ω to 200 T Ω ($2 \times 10^{14}\Omega$).

Also new...

An attractive quantity-discount policy. All GR products are subject to a quantity discount ranging from 3% for 2-4 units to 20% for 100 units.

GENERAL RADIO